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EDITORIALS

REFINEMENTS IN ILLUMINATION.

Nothing better illustrates the flexibility of electric lighting than special applications in which the central-station engineer or the fixture designer solves a problem on a plane above ordinary practice. It is no exaggeration to say that the industry has only begun to appreciate its opportunities in this field. Some of these problems may be stated to advantage. There is a demand now, limited to be sure, but considerable when the possibilities are studied, in the way of providing efficient illumination for the pulpit in chapels serving the deaf, so that lip-reading can be done by the congregation, which cannot get the preacher's meaning by the ordinary methods of communication. Temporary installations have been made which are much better than many of those where no special study has been given to the problem, but in the provision of suitable apparatus to gain the above result without disturbing glare the illuminating engineer can find an interesting and promising test. The need of an installation of this kind was expressed in a recent article in a church periodical by a clergyman experienced in ministering to the deaf, and without question the refinements of modern illumination are equal to the problem.

There is a possibility that the not distant future may witness a demand for a new type of art-museum illumination; that is, for an installation in which artificial light will completely supersede daylight. It is a question whether efforts to maintain a double standard of lighting in such places are worth while in view of the difficulties of securing equally good results with both. It is also worth investigating whether the use of electric lighting with suitable reflection and diffusion may not be better adapted to the maintenance of life in delicate exhibits like certain entomological specimens, animal skins and even tapestries to which a prolonged daylight exposure may be detrimental. Certainly the day has come when the use of museums at night is a consideration of some importance in the large centers, and there is no doubt that conference between the illuminating engineer and the curator might work out plans of lasting benefit to both. A museum load on the daylight schedule makes pretty satisfactory long-hour business from the central-station standpoint.

Other opportunities lie ahead of the lighting expert in the fields of hospital ward and private-room illumination, in the more artistic and better-diffused lighting of hallways in old apartment houses, in the concentration of luminous flux on street corner signs, and in the adaptation of the principles of short-range flood lighting to the requirements of fine residences. The variety of such problems in matters of detail is amazing, and every time one of these is well solved, the whole art of illumination is advanced, with a correspondingly improved outlook for the commercial side of such work, even down to the greater sale of supplies and the increase of central-station outputs.

AMERICAN MANUFACTURERS MAY COMBINE TO SECURE ADVANTAGES IN INTERNATIONAL TRADE.

The Federal Trade Commission has recently sent to the United States Senate a report embodying a unanimous recommendation that the Sherman Act be so amended as to permit business men to use the same weapons which foreign manufacturers have so long employed and utilized very successfully to accomplish results in the development of international trade. The Commission is fully convinced that it is not fair to subject American manufacturers to the competition of European syndicates and then deny to them the right of self defense.

Upon other pages of this issue there is published an abstract of the report submitted to the Senate by the Federal Trade Commission. Copies of the complete report may be secured by applying to the Commission at Washington, D. C. Manufacturers of electrical apparatus of every description have some opportunities for participating in international trade if in the development of their enterprise it becomes expedient for them to reach out in this direction. Therefore it is imperatively necessary that this measure recommended by the Federal Trade Commission after careful study of conditions be given the serious consideration of American manufacturers. Furthermore, foreign trade extension is not a partisan matter. The fruits of an increase in our overseas commerce will be reaped not only by the manufacturers, but by the jobbing and retail merchant interests of the whole country. The Senate bill is particularly in the interest of smaller concerns, since the largest manufacturers have expert export organizations of their own. Business men should promptly write to their senators and representatives, asking them to make the Federal Trade Commission's recommendations a law. There need be no hesitation nor diffidence in approaching these representatives. They are keenly alive to the situation and it is due to them, and will be appreciated by them, if they have the word of their constituents that their action in making the Commission's recommendation a law will meet with approval.

THE NATIONAL ELECTRICAL SAFETY CODE.

The large number of accidents and, more specifically, the number resulting fatally, each year in the United States from electrical causes, coupled with the existing lack of uniformity in the construction and operation of electrical equipment, and the disregard, in many places, of precautions which should be universal, point to the desirability of a set of rules in this field which shall limit electrical hazards to persons and, so far as may be, safeguard human life. Realizing the need of such a set of rules, the officials of the United States Bureau of Standards have for about three years been working upon a compilation of rules which has been designated as a National Electrical Safety Code. These rules were first put forward in tentative form and have since been very greatly modified in accord with the criticisms and suggestions of those who are acquainted with the details of electrical practice. The electrical utilities have taken a prominent part in conferences to this end, and their suggestions have been of great value in modifying the original provisions and drafting a code which will be more possible of complete application, and which will appeal to various local authorities as being suitable for application, or, at least, suitable for a basis upon which to build rules which will be applicable to local conditions.

The Code is divided into four parts, dealing respectively with central stations and their equipment, electrical supply and signal lines, utilization equipment, and operating rules. The fourth section, comprising the operating rules, seems to be entirely acceptable to central-station companies, and was finally drafted with the complete assent of the Accident Prevention Committee of the National Electric Light Association. The sections dealing with utilization equipment and with the installation and maintenance of supply lines have not proved equally acceptable. The few available statistics indicate that about half of the accidents of electrical origin occur among the employees of utility companies, and of these about 15 per cent are due to defective equipment or defective construction, and 85 per cent to carelessness, ignorance or other fault upon the part of employees. It is thus evident that a large number of accidents can be obviated by proper instruction of employees, by the application of appropriate operating rules and proper attention to existing hazards. An approved set of operating rules is consequently a valuable asset to the industry.

Rules designating details of construction are not so welcome for a number of reasons. Most engineers and managers believe that mandatory rules should deal only with results to be achieved, and should leave them free to arrive at these results in whatever way they may deem best. Too great standardization in any line is likely to retard development. Any general set of rules, moreover, is not likely to take proper account of local variations in conditions, and is apt to receive different and unintelligent interpretations in different jurisdictions. It may be applied retroactively, which would involve great hardship upon companies whose existing construction does not conform to the proposed rules. The Bureau of Standards does not claim that the set of rules which it has formulated is perfect, or that it will meet all local conditions. It realizes that field experience is necessary to test the suitability of these rules, that exceptions and local modifications will be needed in them, that they should not be applied to present construction unless a definite and manifest hazard is involved, and that they should be applied with discretion by administrative authorities. When such a code is promulgated, however, there is danger that public service commissions will adopt the rules bodily without adjusting the details of their provisions to local conditions, and without providing for the exceptions which are admittedly demanded in their specific application. The rules may, moreover, be administered by local inspectors without sufficient experience or knowledge to apply them intelligently It is obvious, therefore, that it would not be politic for utility companies or associations of them to indorse the rules without knowing how they are going to be applied. In the State of Washington, for instance, a law which is now upon the statute books would probably have the effect of making such rules retroactive in their effect, and would impose a serious penalty for every departure from exact compliance with the rules.

It is evident, therefore, that state commissions, and others having jurisdiction, should not make such rules mandatory at once and should examine them very carefully with respect to local conditions before attempting to apply them at all. In the meantime it would be well for operating companies to attempt compliance with the Code as soon as the final draft is available, and see to what extent it will inflict hardships upon them in case it were made mandatory. It is claimed that compliance with the rules in small urban communities will involve an expense that will seriously limit the extension of electric service in the future, both by limiting its area and by preventing the reductions in rates which might otherwise become effective. On the other hand, the officials of the Bureau claim that most urban construction already meets the proposed requirements, that no restrictions are placed upon rural lines, except at crossings with railways and with other lines, and that the specifications in such cases are not as severe as are required by some state laws, or as are in use by most operating companies at the present time. It is evident that experience will be needed with the rules before final judgment can be passed upon their merit, and that legal requirements should not be applied to the operating companies until the effect of applying the rules can be determined.

One objection to the rules is that as they stand they would exclude the possibility of making use of bare concentric wiring. If the rules are enacted into law, such a system or any other experimental system could be tried out only under special sanction. Since exceptions of this kind must be frequently made, it is evident that the success of the Code will depend upon its intelligent application and administration, and upon the possibility of frequent revision for the purpose of overcoming its defects and adapting it to the progress of the art.

THE NATIONAL ELECTRICAL CODE.

The fire hazards in electrical construction were early looked into by representatives of fire-insurance companies, with the result that the underwriters formulated a set of rules which has developed into the present National Electrical Code. This Code was originally prepared by the National Board of Fire Underwriters and was revised by them. More recently it has been taken under the jurisdiction of the National Fire Protection Association and is handled by the Electrical Committee of that body, which conducts a biennial revision. The Electrical Committee includes representatives not only of the fire underwriters, but of inspection bureaus and of the national associations of contractors, engineers, inspectors and of the electrical utilities, but has not up to the present time included any representative of the manufacturers of electrical fittings or supplies.

When revisions of the Code have taken place, the final action has been taken in an open meeting of the Committee, and such open meeting has afforded opportunity to the general public, to manufacturers and to any other interests, to present reasons for or against the adoption of any change in the Code. The open meeting of the 1915 revision of the Code demonstrated that this method is not satisfactory and that some better means should be adopted for the presentation of the various points of view of the different manufacturing interests involved. It has been the general idea that the action taken in this open meeting was the final step in deciding what should go into the Code, but this idea probably involves a certain misconception, for it is not likely that the Electrical Committee would shirk the responsibility of overruling the vote of such an assemblage if it believed that the situation and the conditions warranted it in doing so. The Electrical Committee is the responsible body in formulating new editions of the Code, and it must necessarily assume the final responsibility of what goes into that document. Unlike other committees of the National Fire Protection Association, its work does not go before the meeting of the entire association for approval, and responsibility consequently lodges not with the Association as a whole, but with the Electrical Committee.

Now that the electrical manufacturers have organized the Associated Manufacturers of Electrical Supplies, and their respective interests can be fully considered in the deliberations of this body, it will be in order for the delegates of this organization to represent the manufacturers as a whole before the Electrical Committee, and it would be exceedingly appropriate for the Electrical Committee to include one or more representatives of the organization in its own number. In that way the point of view of the manufacturers and their interests could be more fully and properly presented in the councils of the Electrical Committee and their claims would receive more mature consideration and more deliberate action.

The Electrical Committee is called upon not only to exercise legislative functions in formulating the Code, but is frequently called upon to exercise the judicial function of interpreting its revisions. Here, again, it is desirable that points of view of all elements in the industry should be fully represented, in order that a just and wise attitude should be assumed by the Committee.

RATE OF RETURN UNDER REGULATION.

The prospect of increased dividends through economy of operation is a stimulation to every privately owned utility to make improvements in its equipment and its methods which will permit service to be rendered at a decreased cost. Such a stimulus is lacking in publicly owned plants, as is too often flagrantly obvious. There is danger under state regulation that this incentive to economy and efficiency may be removed by restricting the earnings to definite percentages of the investment, regardless of merit in the management and operation. Some of the state commissioners have seen this danger and are holding up the ideal of a policy which will reward good management by more liberal allowances of returns to investors.

The Wisconsin Railroad Commission, which has been a pioneer in the inauguration of many progressive policies in connection with utility regulation, has disclosed a proper attitude upon this question in its eighth annual report. After calling attention to the fact that the electric central station is the only class of utility in the state whose operating expenses decrease from year to year, the Commission says: "These facts tend to show that the burden upon the Commission is to constantly promote efficiency in the way of granting a return to utilities which will induce them to place in operation modern appliances as they are put upon the market. Not only is this the case, but every effort must be made to show to the utilities the advantages and disadvantages of certain methods used in the production of the particular services which they sell. If this is not done, then the hope of future reductions in the price of these services will be by that much diminished."

This shows a realization by the commissioners that both knowledge and motive are necessary to achieve a desired result, which in this case is the reduction in the cost of electric service. An intelligent application of the principles here involved, not only in Wisconsin but in other states, will mean much for the future development of the electrical industry.

Happenings in the Industry

Important Conference on Safety Code Held in Chicago—Meeting Electric Power Club—Kansas Contractors Elect Officers—Fixture Design Discussed in New York —Illuminating Engineering Lectures—Combinations in Behalf of Foreign Trade — Southwestern Electrical and Gas Association — Miscellaneous News Notes

FINAL CONFERENCE ON NATIONAL ELECTRICAL SAFETY CODE.

Bureau of Standards Holds Two-Day Hearing in Chicago.

On May 29 and 30 the Bureau of Standards held a conference on the National Electrical Safety Code in the La Salle Hotel, Chicago. This was the last of about 30 conferences which have been held at various times in different parts of the country to discuss the provisions of this code with the representatives of state commissions, municipalities, utilities and other interested parties. The final draft of the code will now be formulated and it is expected that it will be published some time during the summer.

The conference was attended by nearly 100 representatives of engineering associations, electric light and power companies, telephone companies, railroad companies, fire insurance underwriters, municipal inspectors, public utility and industrial commissions, electrical workers, electric traction companies, electrical manufacturers and others. The Code received the hearty indorsement of the municipal and insurance representatives. Most of the engineers of public service commissions who were present expressed their appreciation of the work done and expected the Code to be of great assistance in formulating local rules. Most of the railroad and telephone representatives welcomed the Code and, while not entirely satisfied with all of its provisions, considered it to be on the whole acceptable. The principal opposition expressed was from the representatives of electric light and power companies, and these objections were very numerous and forceful.

In addition to opposing a number of the individual rules the central-station men pointed out that the construction requirements were in general too severe; that while one code for the entire country was an ambitious and laudable idea, it is not feasible unless written in general terms, since specific details must differ widely in accordance with local conditions. Such a code should specify the results to be obtained, rather than the means for obtaining them; the rules would probably be made retroactive in certain jurisdictions and consequently work great hardship; the interpretation of the rules requires expert knowledge and ability which would not usually be available; and the effect of having such rules enacted into law would place the utility companies in an unfortunate position in case of litigation. For these reasons approval of the Code could not be given either by the central-station representatives as such, nor by the various associations of which they are members.

The Bureau of Standards was represented at the conference by E. B. Rosa, W. J. Canada, E. R. Shepard and W. C. Wagner. Dr. Rosa presided at the five sessions which were held and ably upheld the Bureau and its work. In opening the conference he reported upon the work which has already been done, involving the origin and development of the National Electrical Safety Code, and explained the legality and desirability of the Bureau of Standards undertaking this work. He pointed out the desirability of having a uniform code in the various jurisdictions and explained that the rules are not a detailed construction specification. They are not expected to be made mandatory until they have been given a field trial of a year or more.

At the session on Monday afternoon, W. H. Merrill, director of the Underwriters' Laboratories, spoke in favor of the Electrical Safety Code. W. H. Blood, Jr., representing the National Electrical Light Association; Farley Osgood, representing the American Institute of Electrical Engineers; and R. J. McClelland presented the objections of the central-station companies to the promulgation of the proposed rules. They claimed that the rules would require large expenditures of money without improving safety; that different local conditions are not recognized by the rules; that if the rules are once legally adopted, they would be no longer under control of the Bureau of Standards for interpretation or revision; that the future growth of the industry would be imperiled; that much of the best of present construction does not comply with the rules and the practice of many years in regard to sags would be upset; that concentric wiring would be prohibited. Dr. Rosa pointed out the difficulty of reconciling the conflicting interests in such matters as overhead crossings, where the central-station men claimed the rules were too stringent, while the telephone and railroad men claimed they were not stringent enough. He pointed out that there were no requirements whatever for rural lines except at such crossings and that the requirements within cities were considered by many as not being severe enough. He said that most of the detailed suggestions of central-station men had been adopted and that the specifications for railroad crossings were not as severe as those already adopted in the states of Nebraska, Iowa and Idaho, or as required by specifications which have been agreed upon by the engineering societies. Regarding minuteness of detail, he stated that the first draft of the rules had left a great deal to the judgment of inspectors and had been strongly objected to on this account. As a consequence details had been inserted.

The rules applying to electric power supply stations were then taken up in detail and changes in the provisions and wording were noted. This was followed by a consideration of the rules governing utilization equipment and grounding. The above comprise parts I and III of the Code. It was decided that the introductory paragraphs referring to the scope and application of the rules should be made a part of the latter and suitably numbered. A committee consisting of Henry Nixon, O. L. Cadle and E. J. Blair was asked to report upon Rule 384 concerning the illumination in subways, and decided that subways should be equipped with duplicate lighting systems and recommended that cars also should be equipped with an alternative system for emergency lighting.

C. E. Skinner, of the Westinghouse Electric & Manufacturing Company, raised a number of questions regarding Rule 300, having to do with the examination and approval of material and current-consuming devices. A committee was appointed to consider this matter, consisting of Mr. Skinner, A. H. Moore, V. H. Tousley, H. S. Wynkoop, W. S. Boyd, J. C. Forsyth, Ernest McCleary and R. A. Smith. This committee reported in favor of deleting the note in Rule 300 (*c*), referring to examination as to the suitability of devices. Objections to certain of the grounding rules were made by R. S. Hale and W. H. Blood, Jr., largely owing to their exclusion of concentric wiring. Dr. Rosa stated that a paragraph would be added permitting the trial of experimental methods under proper conditions.

Part II of the rules, referring to the installation and maintenance of electrical supply and signal lines, was considered on Tuesday. Different grades of construction are specified for different conditions. The country is divided into zones

with respect to weather conditions and three conditions of loading are specified for the three zones and construction is required which will withstand such loading. The loading assumed for the worst zone is a radial thickness of one-half inch of ice on the wire, temperature of zero degrees Fahrenheit and a wind pressure of eight pounds per square foot normally. In the second zone, a temperature of 15 degrees is assumed with a loading two-thirds as great. In the third zone a temperature of 30 degrees and a loading of four-ninths of the maximum is assumed. The rules include tables of minimum sags for soft, hard-drawn and medium-hard-drawn copper wires and these sags were considered in detail, with the corresponding tensile stresses resulting.

L. C. Hurtz, representing the United States Independent Telephone Association, asked that No. 12 galvanized steel wire be permitted for use in railroad crossings in arid territory where corrosion is not serious. This precipitated quite a discussion. W. C. Polk, representing the same association, stated that No. 14 wire of this type had been in use for years in Kansas without deterioration. Representatives of steam railroads claimed that such construction would not be safe, that the iron wire formerly used resisted corrosion better than the steel wire which is now supplied and that the railroad had discarded the use of such wire. It would undoubtedly be corroded by the fumes from locomotives where it crosses railroads.

Dr. Rosa advocated the use of medium-hard-drawn wire by power companies in place of the soft wire so frequently used, as it is 50 per cent stronger than the latter and its elastic limit is about double. Mr. Shepard exhibited specimens of splices where such wire was used, showing that no difficulties were introduced.

C. L. LeMaistre, of the British Engineering Standards Committee, was called upon for an address, in which he explained the work of that committee and its relations with the National Physical Laboratory in England. Opinions were also called for as to the application and interpretation of the safety rules, if adopted, from representatives of the state utility commissions, including J. K. Anderson of West Virginia, J. N. Cadby, of Wisconsin, T. J. Strickler, of Kansas, Bert H. Peck, of Illinois, F. J. Rankin, of Colorado, R. N. Bradshaw, of Connecticut, William Nixon, New York (First District), E. S. Cheney, New York (Second District). Comment was also made by H. S. Wynkoop, electrical inspector of New York City, V. H. Tousley, electrical inspector of Chicago; W. S. Boyd and J. C. Forsyth, representing the fire underwriters; Wills Maclachlin and A. C. Davison, representing Canadian interests; R. A. Smith, representing the International Association of Municipal Electricians; P. Junkersfeld, representing the Association of Edison Illuminating Companies; T. L. Rhodes, representing the American Telephone & Telegraph Company; G. A. Cellar, representing the Association of Railway Telegraph Superintendents; and W. S. Vivian, representing the United States Independent Telephone Association.

W. J. Canada told of the results of some investigations of electrical accidents and the economic values which they represent.

The conference closed with a vote of thanks offered by Farley Osgood to Dr. Rosa, Mr. Canada and their associates.

Among others who were present and participated in the discussion were John B. Fisken and G. E. Quinan, representing the Northwest Electric Light & Power Association; O. L. Cadle, representing the American Electric Railway Association; C. W. Stone, of the General Electric Company; J. E. Moore, of the Electric Bond & Share Company; Cecil F. Elmes, of the Federal Light & Traction Company; B. H. Glover, of the Underwriters' Laboratories; William Bennett, of the Chicago & Northwestern Railway Company; S. M. Viele, of the Pennsylvania Railroad; John Leisenring, S. T. Rhodes, A. Schlesinger and W. E. Nolston.

Electric Power Club Discusses Motor Ratings and Standardization Work.

The Electric Power Club held its annual meeting at Hot Springs, Va., May 1-4, with 64 members present, representing companies manufacturing electrical machinery, transformers and control apparatus. The meeting was very successful and a large number of recommendations were adopted tending towards the standardization of all classes of electrical apparatus.

Charles Robbins, of the Westinghouse Electric & Manufacturing Company, read a paper on temperature ratings for open-type motors carrying continuous-time ratings. This question has been before the Electric Power Club for some time, and a recommendation was adopted approving two ratings for open-type continuous-duty motors. The present Electric Power Club rating of 40 degrees centigrade rise at rated load and a 25-per-cent, two-hour overload guarantee at 55 degrees centigrade is retained, this rating to be known and designated as the 40-degree rating, and a new Electric Power Club rating was adopted based on a temperature rise of 50 degrees centigrade without overload guarantee, to be known and designated as the 50-degree rating.

In order to properly distinguish between the two ratings, nameplates are to be marked with temperature and overload guarantees. The following descriptive statement of the two ratings was approved: "Motors having the 40-degree rating are designed for all classes of service including those in which an overload capacity of 25 per cent for two hours is desired." "Motors having the 50-degree rating are designed for conditions in which the load requirements are accurately known and under which the motor will not be subjected to load in excess of the motor rating."

Considerable constructive work was done at this meeting towards the standardization of transformers and industrial control apparatus. These two new sections were added to the Electric Power Club at the last general meeting.

Standard sizes were adopted for mining locomotives, as also electrical performance guarantees, draw-bar pull and the basis of motor rating. Standard voltages for mining locomotive motors were adopted as 125, 250 and 500 volts.

Specifications covering the capacity and voltage regulation of three-wire direct-current generators were revised so as to make 10 per cent unbalancing in the neutral standard. Standard terminal markings for motors, generators and transformers were adopted, the transformer terminal markings to be subject to further conference with the National Electric Light Association. Standard general-purpose alternators shall be designed so as to permit of operation at power-factors at least as low as 0.80.

It is recommended that for geared service outboard bearings be used on motors in frame sizes above and including 75 horsepower at 900 revolutions per minute, and for belted service in frame sizes 250 horsepower at 600 revolusions per minute, and larger. Squirrel-cage elevator motors are to be rated primarily on the basis of guaranteed starting torque and may also be given a horsepower rating based on the brake horsepower which they will develop for the standard time rating selected without exceeding the standard temperature rise. Direct-current motors under normal operating conditions may vary not to exceed 7.5 per cent above or below rated speed in sizes from 1 to 7.5 horsepower at 1,150 revolutions per minute, and 5 per cent in larger frame sizes.

Fractional-horsepower motors must be designed to operate successfully with voltage 10 per cent above or below the rated voltage, but not necessarily within other limits established for normal operation. The allowable variation from rated speed under normal operating conditions for all sizes of fractional-horsepower motors is fixed as not to

exceed 7.5 per cent. It is recognized as standard practice to furnish starting rheostats with shunt and compound-wound direct-current motors 0.5 horsepower and larger.

E. R. Harding, vice-president of the Holtzer, Cabot Manufacturing Company, was re-elected president of the Electric Power Club for the coming year. C. L. Collens, president of the Reliance Electric & Engineering Company, was elected vice-president. C. H. Roth, president of Roth Brothers & Company, was re-elected secretary and treasurer.

Kansas Contractors Elect Officers.

Sixty electrical contractors, including Kansans and visitors from Missouri, participated in the annual convention of the Electrical Contractors' Association of Kansas, at Wichita, May 19. The chief speaker at the morning session was W. B. LaBar, of Utica, N. Y., traveling representative of the national association, who told of the advantages gained by membership in the Electrical Contractors' Association of America. In the afternoon W. L. Hutchison, of Kansas City, Mo., told of the work of the Missouri and of the Kansas City Contractors' Associations, of the co-operation with the national organization and of the work of the local Jovian League.

The contractors were entertained by the Jovian League, of Wichita, at luncheon at noon, dinner in the evening, and with a parade after dinner. Fifteen candidates for Jovianism from among the contractors were imprisoned in an animal cage borrowed from a traveling show, and this spectacle was the feature of a parade, which included also a steam calliope, and electrically illuminated trucks. The rejuvenation was held after the parade.

Officers elected by the Electrical Contractors' Association of Kansas were:

President, J. A. Mercer, Topeka.
Vice-president, William Cates, Hutchinson.
Secretary, R. M. Sutton, Wichita.
Mr. Sutton is also national director for Kansas.

Fixture Design and Glassware Problems Discussed at May Meeting of New York Section, I. E. S.

A new attendance record was again made at the meeting of the New York Section of the Illuminating Engineering Society, held on May 11, at the Engineering Societies Building.

Chairman D. M. Moore addressed over 200 members and guests when he opened the meeting, introducing Stephen de Kosenko of the Sterling Bronze Company, New York, who handled his subject, "Fixture Design," in a unique and absorbing manner. He traced the history of lighting fixtures from the dark ages up to the present, and delighted his hearers by his sketches, in charcoal, made to illustrate the points. Beginning with the holders in metal and clay for slivers of wood and then on through the oil and candle periods, the reasons for many of the designs of today were apparent. His remarks on the more recent efforts were of the critical order, but justifiable, to judge from the attitude of the audience. The heavy metal chains, the buttressed glass bowls and other anachronisms kept up a keen interest. The major faults in public structures are too much light, badly directed light and too much glare. Church lighting suffers from being too spectacular. Picture galleries are not constructed so that they can be well lighted. The qualifications of a fixture designer, as he outlined them, were so exacting that even an artist-architect could not be better equipped.

The second paper of the evening covered "Lighting Glassware" and was presented by A. D. Nash of the Tiffany Furnaces. He outlined the field of the manufacturer and made a plea for a better general understanding as to the character of the product. While glassware represents only 20 per cent of the cost of a fixture installation it is the most important feature of the whole installation. The production of daylight illumination is a function of the lamp manufacturer and not that of the glass man.

The discussion by Messrs. Basset Jones, Norman Macbeth and A. A. Wohlayer had principally to do with the daylight effects and paints for wall surfaces. The possibilities in the latter case are greater than generally understood, as two surfaces of apparently the same whiteness showed a difference of 25 per cent in illumination values.

A number of pieces of glassware were exhibited and also a number of unusual slides of fixture designs.

P. S. Millar outlined the course of lectures to be given in Philadelphia September 21 to 28 and stated that the price of the ticket, $25, would include bound volumes of the forthcoming lectures and also those delivered at the Johns Hopkins course in 1910.

W. F. Little, chairman of the papers committee, announced that at the June meeting, Mr. Dempsey of the New York Edison Company would exhibit moving pictures of street lighting construction and maintenance. Following the paper there will be an auto-inspection covering the types of lighting described.

"Get-Together" Dinner Given By the Lighting Sales Bureau of N. E. L. A.

An opportunity afforded to every one interested in the lighting branch of the electrical industry to meet the prominent men of the lighting sales bureau of the Commercial Section of the National Electric Light Association was given at a "get-together" dinner given by the Bureau on May 25 at the Morrison Hotel, Chicago. The dinner was featured by the appointments, which included a number of illumination features. A wide diversity of entertainment was provided and greatly enjoyed by those in attendance.

J. G. Learned, chairman of the Lighting Sales Bureau, presided at the dinner. The speaker of the evening was John F. Gilchrist, vice-president of the Commonwealth Edison Company, who spoke at some length of his 30 years of experience during the development of the electric-lighting industry. He gave a large number of examples of the progress already made and outlined in a large way the development to be expected in this line of activity.

The dinner was very successful and the attendance, which was well over 200, proved the great popularity of the Lighting Sales Bureau.

The Illuminating Engineering Lecture Course.

The preliminary list of subjects for the course of 21 lectures to be given at the University of Pennsylvania, following the convention of the Illuminating Engineering Society, is as follows: The Principles of Interior Illumination (2); the Principles of Exterior Illumination; Color in Lighting; Architectural and Decorative Aspects of Lighting; Recent Developments in Electric Lighting Appliances; Recent Developments in Gas Lighting Appliances; Modern Lighting Accessories; The Lighting of Factories, Mills and Workshops; The Lighting of Offices, Stores and Show Windows; The Lighting of Schools, Auditoriums and Libraries; The Lighting of Churches; Theater Lighting (including Stage Lighting) and the Lighting of Art Museums; The Lighting of the Home; Train Lighting; Street Lighting (2); The Lighting of Yards, Docks and Other Outside Works; Headlights, Search-lights and Projectors; Sign Lighting; Building Exterior, Exposition and Pageant Lighting.

The course is directed specially toward the practical application of the principles to the work of illuminating engineering as carried on today by the latest methods and with the most recent equipment. It ought to appeal with particular force not only to the engineer, but to those whose contact with illuminat-

ing engineering is chiefly commercial. It should impress upon those, who in their daily task have to deal with the applications of artificial light, a firmer grasp of advantageous methods and a closer understanding of the things which are necessary to make electricity of the maximum usefulness to the consumer.

COMBINATIONS IN BEHALF OF FOREIGN TRADE.

Federal Commission Emphasizes the Obstacles Which Confront Our Producers When Seeking Foreign Markets —Urges Modification of Our Anti-Trust Laws.

Acting under authority of the statute under which it was established and is maintained, the Federal Trade Commission has made a careful investigation of the competitive conditions affecting American concerns in international trade. The commission finds:

(1) That other nations enjoy marked advantages in foreign trade, from superior facilities and more effective organizations;

(2) That doubt and fear as to legal restrictions prevent Americans from developing equally effective organizations for overseas business and that the foreign trade of our manufacturers and producers—particularly the smaller concerns —suffers in consequence.

Appreciating the importance of fostering foreign trade and realizing the urgent need of enabling our citizens to meet foreigners on equal terms in international commerce, the commission recommends the immediate clarification of the law, so as to permit co-operation among Americans for export trade.

Foreign Exporters' Advantages.

The commission finds that foreign nations have built up their ocean shipping, have granted low export railway rates and have combined their land and ocean transportation facilities to give their shippers ready entrance into their overseas markets. The United States, on the contrary, has neglected its merchant marine, until we are dependent upon our commercial rivals to deliver our goods. In consequence, the transportation of our products is now largely controlled by powerful international combinations of foreign shipowners, who discriminate against American shippers.

Foreign nations, moreover, have not only established connections with banking houses in every land, but have dotted the map of the world with foreign trade banks of their own. They give the foreign exporters information, extend credit, finance his transactions and constantly strive to increase the foreign business of the mother country. The few foreign branches of American banks have but recently been established, and in most markets our exporters must still depend on alien bankers.

British, French, German and other foreign traders enjoy a peculiar advantage from the investments made by their fellow nationals in foreign lands, frequently on the express condition that supplies and equipment be purchased in the country furnishing the funds. British and German investments in South American railways and public utilities, French investments in Turkey, and Japanese investments in China and Manchuria are typical examples. Time and again American manufacturers have found it impossible to sell their products abroad because the prospective customer was forced to purchase from, or through, interested investors.

In seeking business abroad American manufacturers and producers must meet aggressive competition from powerful foreign combinations, often international in character. In Europe, in Japan and elsewhere, business men, often aided by their governments, have developed comprehensive combinations which effectually unite their activities.

German Combinations.

In Germany, prior to the war, there were 600 important cartels—i. e., combinations to control the market—embracing practically every industry in the Empire. Many dominated the export trade of their industries and carried on vigorous campaigns to extend their foreign business, to prevent competition among German producers in foreign markets and to secure profitable prices.

Thus the German dye-color industry operated as a unit in foreign trade, under the leadership of two great groups of allied producers, the Badische group and the Höchst-Casella, which were working under agreement to avoid competition between themselves for fifty years. The manufacture and exportation of electrical equipment has been made one of the bulwarks of German foreign trade by two great companies, the Allgemeine Electricitäts Gesellschaft and the Siemens-Schuckert, with numerous subsidiaries at home and abroad working in harmony with each other.

Similar syndicates obtain in France and Belgium, Italy, Russia, Austria Hungary, Australia, Sweden, Greece, Argentina, Chile, Equador and in Japan and China.

The commission urges the pressing need of immediate action. It does not believe that Congress intended by the anti-trust laws to prevent Americans from co-operating in export trade for the purpose of competing effectively with foreigners where such co-operation does not restrict trade within the United States and where no attempt is made to hinder American competitors from securing their due share of the trade. If American business men are to make the most of the great opportunities now before them, they must build securely in foreign trade to avoid disaster in the shock of the stern and determined competition that will doubtless follow the war and must at once perfect the organization which the conditions of international trade demand.

Convention of Ontario Electrical Dealers' and Contractors' Association.

The second annual convention of the Electrical Dealers' and Contractors' Association of Ontario is to be held at Toronto, Canada, on June 6 to 8. The meetings will be held at Massey Hall. The following is the condensed program for the convention:

Tuesday morning session: Opening address by President G. D. Earle; address on "Organization," by E. A. Drury. Tuesday afternoon session: Report of Committee on Licensing, by William Henry Lodge, chairman; address on "Inspection," by H. F. Strickland, chief electrical inspector of Ontario.

Wednesday morning session: Paper on "Advertising," by J. C. Kirkwood; three papers on "Resale," by R. Grant, C. A. McLean and Edward J. Wied; paper on "How to Keep the Electrical Business in the Family," by Gordon C. Keith. Wednesday afternoon session: Papen on "Cost of House Wiring," by C. D. Henderson; four addresses on "Co-operation," by Walter Carr, F. M. Dusenbury, A. H. W. Joyner and A. C. Lyons.

Thursday morning session: Paper on "Bookkeeping and Accounting," by Ernest Griffith; reports of the following committees: Architects, by Martin Nealon; Compensation, by G. T. Dale; Electrical Development, by H. M. Kewman; election of officers. Thursday afternoon session: Paper on "Illumination," by T. M. Deblois; a practical talk on "Incandescent Lamps," by W. B. Burnett.

Throughout the meeting there will be an electrical show at which a considerable number of American and Canadian manufacturers will have interesting exhibits. A number of entertainment features are included, one of which is a moonlight excursion on Lake Ontario on Wednesday evening. The acting secretary of the association is Marshall S. Soules, Oshawa, Ont. The chairman of the Electrical Show Committee is E. A. Drury, 45 Moutray Street, Toronto.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION CONVENTION.

Twelfth Annual Meeting at Galveston Considers Electric Cooking and Other Kindred Topics of General Interest.

For the fourth time in as many years the Southwestern Electrical and Gas Association held its annual convention in the city of Galveston. This, its twelfth annual convention, was presided over by David Daly, manager of the Houston Electric Company, Houston, Tex. True southern hospitality pervaded the entire convention but was personally extended on behalf of the citizens of Galveston by Mart H. Royston, city attorney. W. B. Head, vice-president of the Texas Power & Light Company, of Dallas, responded very appropriately on behalf of the Association.

The opening session on Wednesday, May 17, was occupied principally by the reading of reports. Secretary H. S. Cooper, of Dallas, stated in his report on the affairs of the Association that the membership had been maintained at its high mark for the past year. This is a compliment to the work of the Association, in view of the unfavorable business conditions.

President Daly in his address, while speaking particularly of the street railway, stated a principle that is more or less involved in the development of any utility when he said: "Nothing costs the community less to give, nothing is so conducive to its solid and substantial upbuilding as security to the capital that is devoted to its needs and services. And yet what do we constantly see? Every safeguard that can be taken away from this capital is considered a victory for the public; every burden that can be placed upon it, a political asset for the man that placed the burden. The temporary advantage of the individual, the glittering expedient of the present make an effective appeal—and, as always, made with the most righteous attitude, with seeming solicitude for the common people.

"Those who attack do not use a bludgeon and batter us into a shapeless mass. That would arouse the sense of decency and fair dealing that all the public have at bottom and would defeat the effort. The attacks are subtle. They promise great relief to the public, but instead of frankly taking away from use a great part of our property they urge the clipping off at the two ends of our income, leaving a residue that in value is equivalent to only a portion of the property we formerly possessed. The value of a public service is in the income that it produces."

The Wednesday afternoon and Thursday morning sessions were devoted to papers and discussions on subjects directly interesting to street-railway men, and coincident with the Thursday afternoon session on the general subject of rates for light and power there was held a special session of claim agents for street-railway companies. The matter of rates was introduced by the report of a Committee on Rates. The subject was treated under the subheads of "Standardization and Simplification of Rates," "The Equity of Dissimilar Rates for Different Uses of Public Utility Commodities or Services," "Discriminatory Rates," "Publicity of Rates," "Relation with and Education of the Public with Reference to Rates," "Forms of Customer's Contracts" and "The Combining of Lighting Franchises with City Lighting Contracts." The object of this discussion was to arrive, if possible, at a basic principle of rate-making rather than the naming of any particular rate for any definite class of service. Those participating principally in the discussion were J. C. Kennedy, manager of the Brenham Compress, Oil & Manufacturing Company; B. F. Cherry, City of Weatherford Water, Light & Ice Company; Prof. F. C. Bolton, A. & M. College of Texas; D. A. Hegarty, of Houston; R. J. Irvine, of San Angelo Water, Light & Power Company; D. R. Locher, general manager of the Corpus Christi Railway & Light Company, and L. L. Stephenson, of Dallas.

Friday Morning Session.

The first paper to be presented at this session was by A. E. Warner, illuminating engineer of the Dallas Electric Light & Power Company, on the subject of "The Practical Side of Modern Illumination."

The discussion of this paper was opened by Walter G. Ross, commercial agent of the Dallas Electric Light & Power Company, who said that the illuminating field is advancing so rapidly that those in close contact with the business must exert every effort to keep pace with it. Mr. Ross also spoke of the help received by central-station managers from the manufacturers of appliances.

"Commercial Exploitation of Electric Current for Cooking and Heating," by J. A. Dupree, manager of the electric appliance department, Corpus Christi Railway & Light Company, received more consideration than almost any other paper presented at the convention. The discussion was spirited and reluctantly discontinued when it came time for adjournment. A number of ladies were present to hear this paper and invited to take part in the discussion. R. J. Irvine, of San Angelo, asked whether material changes in the distribution system were found necessary. Mr. Dupree in reply stated that owing to the fact that they had not installed very many ranges so far that question had not received very great consideration, but that they employed a wire of sufficient carrying capacity to also take care of their ranges. In reply to a further question by Mr. Irvine as to how he prevented the abuse of cooking installation by people who would be disposed to do so, Mr. Dupree said: "Most of our wiring is what you might call ironclad service. The wires are installed in conduit which would make it difficult for anybody to connect the current for lighting. All of our lighting and cooking circuits are run with 110-volt service, with which we have not experienced any trouble." J. C. Kennedy, manager of the Brenham Compress, Oil & Manufacturing Company, referred to the high price of electric ranges and stated that although they had adopted the 30-day trial method they had found it expensive and not altogether satisfactory. D. R. Locher, general manager of the Corpus Christi Railway & Light Company, said his company was really forced to adopt the 30-day trial plan so that the customers might be shown that the electric range can do what is claimed for it.

H. H. Russell, heating specialist of the General Electric Company, Schnectady, gave some very useful information concerning the installation and operation of electric ranges. The points of his discussion might be summarized as follows: "I find that adequate instruction in the handling of a range is practically as necessary as adequate instruction in handling an automobile. I have found that where the meter was installed directly over or behind the range in such a place where the person using the range could see it, and where such a person was taught how to read the meter and thus check up the amount of current used every day, we have not yet lost the sale of a range. There are really two methods that may be employed in the sale of ranges. One might be called campaigning and the other exploitation. It is the same thing which has popularized the vacuum cleaner, the electric flatiron and practically every other accessory that has been put out. The percentage of sales during the past eight months covering something over 250 ranges has been about 90 per cent. In other words, that percentage of ranges has given satisfaction. The idea has been, or perhaps it has been taken for granted without thought on the part of most people, that it is the rich

people who will take the electric range first. Our experience has proven that that is absolutely untrue; that the people who are going to create the electric range industry will be the people of the middle class, people who are intelligent but who do not have servants. We employ a demonstrator in chief and a secondary set of demonstrators known as local instructresses. In other words, when we have sold a range we make arrangements with some lady in town to whom possibly the remuneration might be an advantage, and she is known as the local instructress. We have found that the system of having a local demonstrator is an absolute necessity and where we have not had a local instructress our results have not been as good. It is not advertised in any way, but whenever a range is sold this lady is notified and gets in touch with the customer by telephone or otherwise and in a series of three lessons instructs her in the use of the range. For this service the local instructress receives two dollars. Also for every range that she can arrange to put in on trial with the intention of purchase we give her an additional two dollars, and so that she won't lose interest if any such sale is completed we allow her a further commission of five dollars. It is possible for her to make nine dollars in this way on each sale."

A. L. Chase, manager of the Texas Southern Electric Company, Clarendon, said that the equipping of domestic-science departments in high schools with electric-cooking devices as well as sewing-machine motors and appliances of that kind was a means of introducing these devices and educating the younger people in their use and creating a demand for them. J. C. Kennedy further stated that in connection with their uptown store they advertised that their lady demonstrator was in attendance to demonstrate the use of electric appliances. "This lady on her own account serves the business men and ladies that work in the department stores downtown with a lunch electrically cooked which brings the matter very forcibly to the attention of the public," said Mr. Kennedy.

In concluding the discussion on this subject H. H. Russell supplemented his former discussion by saying: "At the present time we have just finished the period of experimentation. There is one company now that has an electric range which contains an element which is incased in a steel sheathing which makes it not only proof against physical damage but also prevents any oxidation, the two essential features for the long life of any heating element."

"How to Increase the Power Load with Profit to Both Company and Customer," by Walter G. Ross, commercial agent, Dallas Electric Light & Power Company, was the next paper to be presented at the Friday morning session, but owing to the great length of the program there was no time for its discussion.

Final Session.

At the Friday afternoon session reports of the various committees were made. The report of the Committee on the Affairs of the Association made by a special committee included the recommendation that $5,500 be appropriated for the conduct of the Association's affairs for the coming year. In all probability the next meeting place will be in Galveston, although its selection is a matter for the Executive Committee.

The following officers were elected for the ensuing year:

President, F. R. Slater.

First vice-president, H. C. Morris.

Second vice-president, D. A. Hegarty.

Third vice-president, W. A. Sullivan.

Treasurer, J. B. Walker.

H. S. Cooper of Dallas, who has been secretary for several years, will no doubt be continued in that office, though the selection is made by the Executive Committee.

OHIO NEW-BUSINESS MEETING.

Timely Discussion of Commercial Problem Held Under Auspices of Ohio Electric Light Association.

A very interesting meeting of the New-Business Co-operation Committee of the Ohio Electric Light Association was held in Newark, O., on May 12.

H. B. Craft, of the Columbus Railway, Power & Light Company, in a paper on "Motor Drive as Against Gas Engine Drive," pointed out that the electric motor in the matter of initial cost, flexibility, maintenance, fire hazard, cleanliness and other features is easily the superior of the gas engine, and asserted that these facts far more than outweigh the slight difference between fuel and power bills.

The discussion brought out the fact that the small single-cylinder engine uses 35 to 40 cubic feet of gas per kilowatt-hour, while the multi-cylinder type uses 20 cubic feet per kilowatt-hour with gas of about 1,020 British thermal units. In a case cited it was found that the actual gas bills amounted to only $450 per year, but a close examination of the books showed a total fuel and maintenance cost of $1,450; moreover, the gas engine gave a speed variation of the line shaft of 6.5 per cent either way. This was replaced by an electric motor which cut this variation down to 0.5 per cent and operated for $1,500 a year.

A paper by C. M. Gilbert, sales manager of the Huetteman-Kramer Company, Detroit, Mich., dealt with the advantages that will accrue to both the central station and the compression-ice-making manufacturer by co-operative effort on the part of both in the installation of electrically driven ice plants. In the discussion it was pointed out that many ice-machine manufacturers show no enthusiasm in this regard and that in some instances are actually antagonistic toward the central station.

In a paper on "Industrial Electrical Heating Appliances" Mr. McKinney, of the General Electric Company, dealt with the advances in different applications of electric heating, with special emphasis on the present status of electric baking of enamel and japan on automobile parts and similar work. In a given case the time of baking on this kind of work was cut from six hours necessary with gas to one and a half hours with electricity, and the resultant finish was of a higher grade.

Dexter Rollins, of the Simplex Electric Company, presented a paper reviewing the merits of the different appliances of his company and asserted that a first-class appliance, even at the necessary higher price, is a much better proposition for the central station than a cheaper device which quickly fails. The question of water heating in connection with domestic electric ranges caused considerable discussion. It was brought out that some companies are giving on water heaters a rate of $1 per month per kilowatt.

J. E. Swan, of the Hotpoint Electric Heating Company, explained the work being done by the co-operative bureau of his company to aid central stations in every possible way to sell electric heating devices. H. G. Hopkins, of the Westinghouse Electric & Manufacturing Company, reviewed the new heating appliances being placed on the market by this company and described the methods and results of several successful appliance sales campaigns.

R. E. Woolley, of the Standard Electric Stove Company, made a point of the fact that every use of electricity can be supplanted by gas at a lower cost for fuel, but in no other field than cooking is this fact a predominant argument against electricity; therefore, why should an attempt be made to sell electric cooking on a basis of price competition with gas. He also stated emphatically that for the present electric ranges will not be bought, but must be sold.

Miscellaneous NEWS NOTES

White-Way Celebration.—The Hudson City Board of Trade, Jersey City, N. J., is arranging for a three-day celebration, June 13-15, in connection with the inauguration of a new white-way lighting system on Central Avenue.

Utility Company Brings Suit Against City.—The Central Indiana Lighting Company has brought suit against the city of Columbus, Ind., and the Sanborn Electric Company, of Indianapolis, asking that the defendants be perpetually enjoined from executing a contract to build an electric-lighting plant at Columbus at a cost of $16,000, and from engaging in commercial lighting. The plaintiff contends that the contract is illegal. The city has been engaged in municipal lighting for years.

Indiana Lighting Company Moves.—The office of the Indiana Lighting Company which has been located in the Merchants Bank Building, Indianapolis, will have been moved to Hammond, Ind., by June 1, as a result of the consolidation of the company, together with other interests, with the Northern Indiana Gas & Electric Company since February 1.

Kansas City Jovian League and Advertising Club Meet.—The Jovian League of Kansas City, Mo., met with the Kansas City Advertising Club at luncheon May 12 during the latter club's annual exhibit of advertising. P. L. Lewis addressed the gathering on behalf of the electrical industry represented by over 50 Jovians, and mentioned the activities of the electrical interests in national advertising and opportunities for co-operation with advertising clubs.

Wireless Patent Trial Postponed.—Attorneys for the Marconi Company, in its case against Kilbourne & Clark Manufacturing Company, have secured a continuance of the trial until July 18, on the ground that the Marconi Company had been in error as to the characteristics of the "Simpson" mercury-valve transmitter of the Kilbourne & Clark Manufacturing Company when complaints were originally filed in Brooklyn and Buffalo, N. Y. The Marconi engineers will be enabled to make additional tests upon which to base claims of infringement of the patent.

To Illuminate Lincoln Highway Into Oakland.—Plans are under way to electrically illuminate the Lincoln Highway into Oakland, Cal., and a resolution has been passed in the City Council instructing the superintendent of the city electrical department to draw up plans for this lighting. A test of the various methods of illumination best suited for motoring will be made. The plan includes the lighting of about four miles of the road. This will be the third section of the Lincoln Highway to be electrically illuminated by the cities through which it passes, the other sections being at Aurora, Ill., and Salt Lake City, Utah.

New York Edison Company School Holds Graduation Exercises.—Commencement exercises for the graduating class of the New York Edison company's commercial school, were held on May 10 at the Company's Auditorium, 44 West 27th Street. Dr. Charles P. Steinmetz addressed the 60 members of the graduating class on "Educational Requirements in Modern Industry." F. C. Henderschott, manager of the Bureau of Education, also addressed the graduates. The prescribed course of lectures and studies of the school extend over a period of two years and embrace a broad variety of subjects. Of the 60 graduates, 45 are employees of the New York Edison Company, 6 of the New York & Queens Electric Light & Power Company, 4 of the Westchester Lighting Company, 2 of the United Electric Light & Power Company, and 3 from the Yonkers Electric Light & Power Company. This is the fifth annual graduating class of the New York Edison Company's commercial school and the total number of graduates including members of this year's class is approximately 300.

The Power Barge for River Traffic.—The Engineers' and Architects' Club, of Louisville, Ky., recently heard an address by Roscoe Kent, of the Howard Shipyards, Jeffersonville, Ind., on "The Power Barge for River Traffic." The shipyards has recently launched the first of a fleet of 36 large power barges which it will build for the Inland Navigation Company, operating on gas-engine-generated energy.

Telephone Societies Hold Joint Meeting.—The annual meeting of the Telephone Society of New York, was held in New York City May 19, the meeting being in conjunction with meetings in Philadelphia, Baltimore and San Francisco, communication being established by means of the Bell Telephone System, of which a demonstration was given. At New York, officers and executive committee members were elected, I. J. Thorp, of the New York Telephone Society, being elected president for the ensuing year.

Electric Street Lighting in New York City.—On June 8, the New York Section of the Illuminating Engineering Society will be addressed by W. T. Dempsey on "Electric Street Lighting in New York." The meeting will be held at the United Electric Light & Power Company's 187th Street station. Moving pictures showing methods of installation, construction, maintenance and standardization of equipment will be shown. An inspection tour will be made through Manhattan to note the street-lighting installations.

To Appraise Central Station at Seymour, Ind.—Engineers representing the Indiana Public Service Company will shortly be sent to Seymour, Ind., where they will appraise the local property of the Interstate Public Service Company, with the purpose of arriving at the proper service charge which may be made by the company. Six months ago the city offered the company a schedule providing for material reductions in street-lighting and domestic service, which was refused, afterward the matter being referred to the commission. The city contends that the value of the local plant does not exceed $100,000, while it is stated that dividends are being paid on a $450,000 valuation.

Ontario Hydro-Electric Commission Acquires Extensive Properties.—The act passed by the Ontario Legislature, affecting the Electric Power Company, Limited, marks another step in the history of public ownership in that province. The Electric Power Company is comparable in size and scope of its operations with the Hydro-Electric Power Company of Ontario, controlling at the time of sale, March of the present year, 22 electrical companies operating in and around the Trent Valley district. These companies are as follows: Auburn Power Company, Limited; Central Ontario Power Company, Limited; City Gas Company of Oshawa, Limited; Cobourg Utilities Corporation, Limited; Cobourg Water & Electric Company; Cobourg Gas, Light & Water Company; Eastern Power Company, Limited; Light, Heat & Power Company of Lindsay; Napanee Gas Company, Limited; Napanee Water & Electric Company; Nipissing Power Company, Limited; Northumberland Pulp Company, Limited; Oshawa Electric Light Company; Otonabee Power Company, Limited; North Bay Light, Heat & Power Company; Peterborough Light & Power Company, Limited; Peterborough Radial Railway Company; Port Hope Electric Light & Power Company; Seymour Power & Electric Company, Limited; Sidney Electric Power Company, Limited; Trenton Electric & Water Company, Limited, and Tweed Electric Light & Power Company, Limited. The act states that the treasurer of the Province of Ontario is authorized to issue debentures of the Province of Ontario, to the amount of $8,350,000, in payment for this property, the debentures to bear interest at the rate of four per cent. The operation of the newly acquired property has been handed over to the Hydro-Electric Commission of Ontario.

Use of Electric Power for Public Works

Advantages of Electrical Construction Methods in the Execution of Important Projects as Exemplified in the Wilson Avenue Water Tunnel in Chicago

Industrial Power Series—Article No. 165

ELECTRICITY is playing an increasingly important part in construction work and particularly in carrying out public projects of considerable magnitude. The first use of electricity in such service was for lighting by means of arc lamps many works whose urgent completion required carrying on construction both day and night. As the adaptability of the electric motor became recognized, its use for hoisting, driving concrete mixers, drainage pumps, etc., gradually increased until now there are under way numerous important public projects in which electric power is used almost exclusively. In many undertakings the use of electricity for power purposes exceeds its use for lighting.

Probably the most common use of electric power in construction work is for hoisting, for which motors arranged for speed control are generally backgeared to the drum. For driving concrete mixers, air compressors, blowers, rock crushers or screens, either leather or chain belt drive is commonly employed, although in some cases direct connection is advisable where the driven machine operates at fairly high speed. Pumps of the centrifugal type directly connected to the motor are best for construction work. In all such work the most rugged types of machinery are preferred for self-evident reasons. Therefore the polyphase squirrel-cage induction motor is the best suited for all purposes where practically constant speed can be used. For variable speed the polyphase induction motor with secondary resistance is reliably providing all the speed control that is needed. Because of the desire to avoid commutation troubles, direct-current motors are not so generally used in this service as formerly; in fact, they are now employed chiefly where direct-current power alone is available.

For lighting an extensive work at night the use of arc lamps is no longer common, unless the contractor doing the work wishes to make use of old equipment on hand. For illuminating foundation work and the structural part at least in many buildings and for illuminating canal, sewer or open-cut subway work, etc., the use of flood lamps has in the last year or so been found to be exceptionally advantageous. These employ tungsten incandescent lamps of the gas-filled type mounted in projectors which permit throwing the light to the zone where the work is carried on. This type of lighting requires relatively few lamps and places them out of the way of derricks, excavating shovels and other construction machinery and allows the

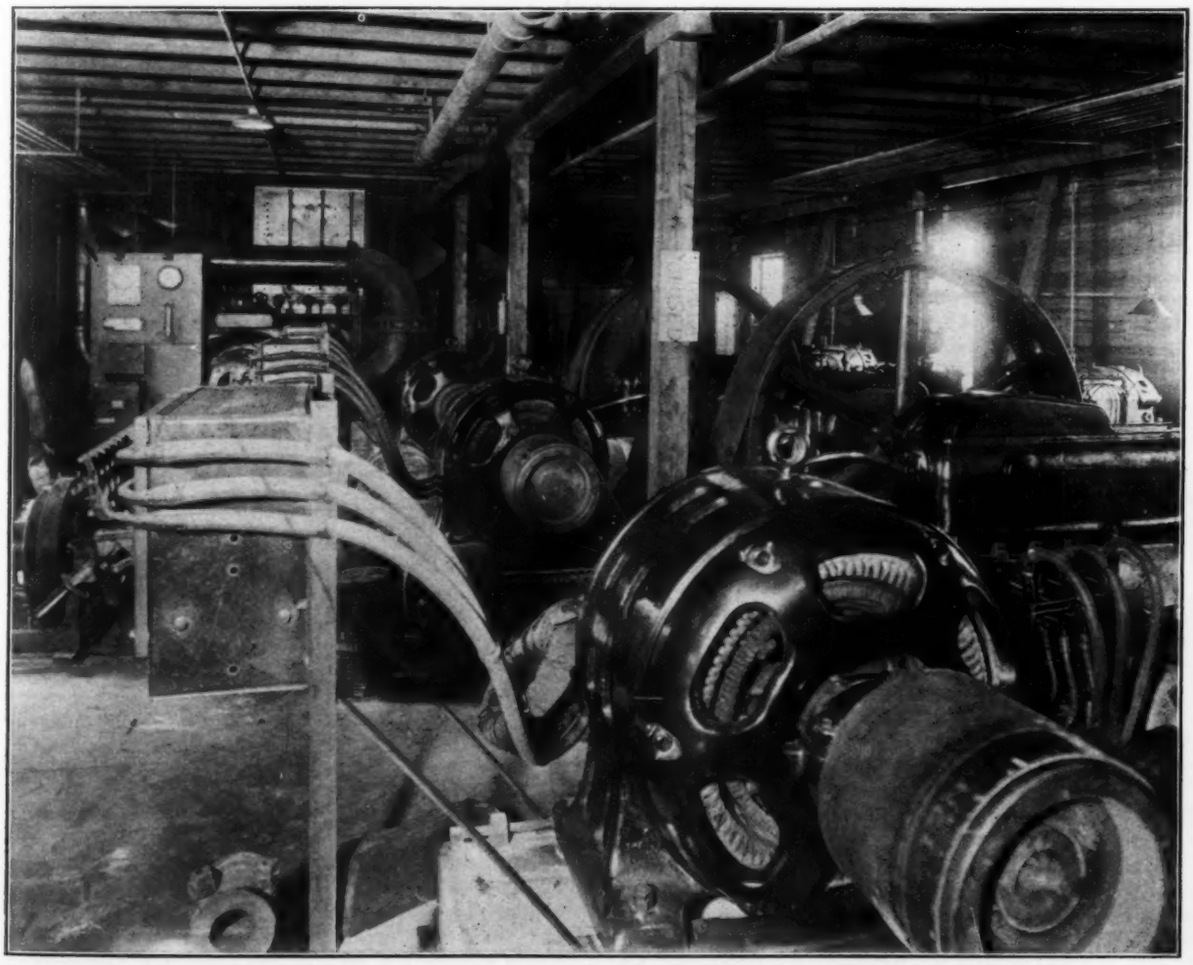


Fig. 1.—A Battery of Motor-Driven Air Compressors at Lawndale Shaft of Wilson Avenue Tunnel, Chicago.

work to proceed unhampered by the numerous wires that formerly were needed for use with arc lamps, which had to be mounted directly above or close to the work that was to be illuminated. For lighting up the interior floors of a large building under construction, as well as for

Fig. 2.—Motor-Driven Centrifugal Blower for Supplying Air to Tunnel Workmen.

illuminating a tunnel or other inclosed space, flood lamps of course are not suited and in this case either tungsten or carbon lamps are made use of, usually being well protected by means of wire guards.

Advantages of Electric Power.

The advantages to be gained by using electricity instead of steam or other kind of energy are numerous and include economy in first cost of construction equipment, as well as more economical and less troublesome operation thereof, also its greater safety from fire, explosion and other dangers, its convenience, readiness and portability, its adaptability to a variety of purposes, its ability to furnish power where needed without long lines of belting, rope drive or steam piping, and its elimination of objectionable smoke and noise attendant on the use of steam. The relative importance and order of these advantages depends largely upon local conditions and requirements. In many cases special advantages accrue from the conditions prevailing.

The opinion may be held that the use of electricity in construction work is most advantageous where electric power lines are at hand or can be easily extended. While this is true in general, many cases have arisen where electric plants have been especially installed for the purpose of carrying on the construction work. This has noticeably been the case in several irrigation projects in the West, where the cost of bringing fuel to the point where power was needed would have been prohibitive. In such cases either a temporary or a preliminary portion of a hydro-electric plant has been construced to provide the power during the work. A noteworthy case of this kind was the building of the Roosevelt dam for the Salt River Valley irrigation project in Arizona.

Among other important public projects in which the use of electric power has been or is being extensively made are the Los Angeles Aqueduct and the Catskill Aqueduct which latter is now under way to bring a new water supply to New York City. In the later stages of the construction of the Panama Canal considerable electric power was made use of and throughout the construction electric lighting was generally employed. In the building of the new subways in New York City electric power is being used on a large scale, both for driving motors and for night illumination. In this case the particular advantages it possesses over other sources of power for city use are especially prominent. If steam were used in such an extensive undertaking, a very large number of small donkey engines producing much smoke and noise would have to be employed. The cleanliness and ready portability of the motor drive is in this case particularly conspicuous. Another project of considerable magnitude is that involved in the construction of the Wilson Avenue water tunnel in Chicago. In this case not only is electric power used on a very large scale and for a great variety of purposes, but the construction work on this project has brought about the development of several new construction methods, a description of which is timely as their adoption on other tunneling projects may be the means for effecting important economies both in cost and time of construction.

Wilson Avenue Tunnel.

The Wilson Avenue tunnel is to supply water from Lake Michigan to a new pumping station to be installed in the northwestern portion of Chicago. The rapid growth of the population in this section has necessitated urgent provision on a liberal scale for an abundant supply of water. The main tunnel will have a total length of about 8.5 miles, of which over three miles extends under the lake to a new intake crib and something over five miles lies directly under Wilson Avenue. The eastern 5,800 feet of tunnel will have a finished bore equivalent to a circle of 13 feet in diameter, although the section is not to be exactly circular. At this point a short tunnel running south will connect with the present Lake View intake crib and this latter intake will be dismantled because it is not sufficiently far from shore to insure constant purity of water. The remaining portion of the tunnel to its present terminus, where the new Mayfair pumping station is being erected, will have a finished section equivalent to a 12-foot circle. At the shore line a short eight-foot branch tunnel con-

Fig. 3.—One of the Control Boards for Blower Motors.

nects with the present Lake View pumping station so that this station will be able to receive its supply of water from the new Wilson Avenue crib through either of two tunnels connecting with the Wilson Avenue tunnel.

As the engineering work on this tunnel was begun a number of borings were made along the line and it was found

that at a depth of about 160 feet below street surface an apparently unbroken bed of solid limestone rock would be met with. Since tunnel excavation in clay or sand is very much more expensive and troublesome than that in the easily worked rock underlying the city, it was decided to excavate the tunnel through this solid rock. Numerous advantages have resulted from this decision, among which is the ability to use a considerable portion of the rock blasted out of the bore in making the concrete lining for the entire tunnel, and for this purpose a novel method of carrying on simultaneously both mining of the rock and concrete lining, without bringing any of the rock to the surface, has been developed.

In previous similar tunneling work the city had met with considerable delays, heavy charges for extras, and other difficulties when the work had been done by contract. The city had gained some experience in tunnel work done by its own forces on the day-labor plan. This led to the opinion that the latter plan would result in more economical and rapid construction. Consequently, when bids that were not entirely satisfactory were received for part of the Wilson Avenue tunnel work, it was decided that the city should carry on the bulk of this work itself by day labor and fully 95 per cent of the entire work is being done in this way.

The only work being done by contract is the construc-

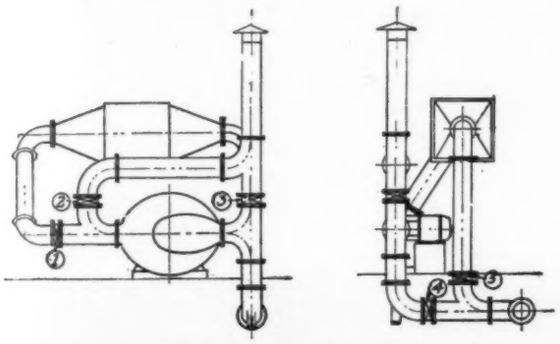


Fig. 4.—Diagram of Ventilation Equipment.

tion of the new intake crib and shaft in the lake and about 2,000 feet of the eastern end of the tunnel. If the city had undertaken this part of the work also, an expensive plant for working in the lake would have been required for which the city would have had relatively little subsequent use. It was decided to tunnel the lake portion without an intermediate crib, although previous practice had always included such a temporary shaft. About seven-eighths of the lake portion, or about 14,000 feet, is being built eastward from the short shaft. Over 9,000 feet of this has already been mined.

Between the shore shaft and that at the Mayfair station, or western end of the tunnel, there are two intermediate shafts, from each of which work was pushed in both directions. Thus the land section of the tunnel has been excavated in six drifts; over three-fourths of this section has already been mined. The preliminary work on the tunnel construction was done in 1913 and late that year the shore shaft was sunk. Active work on the tunneling began in 1914 when the three other shafts were sunk.

At each of the four shafts a machinery or "power" house was built, also shops, storehouses and locker and dressing rooms for the men, and a small boiler house for a low-pressure boiler furnishing steam for heating in cold weather. Each of the four machinery houses contains three or four air compressors for furnishing compressed air for the rock-drilling and concrete-lining operations, also one or two blowers for ventilating the tunnel, and a hoist. In the tunnel at the foot of the shaft are one or more pumps for dewatering each drift. All of this machinery is motor-driven.

Electric Power Supply.

Before deciding to use electric power for the operation of this machinery, as well as other machinery that was added subsequently, the relative merits of installing a steam plant and of purchasing electric power were carefully considered.

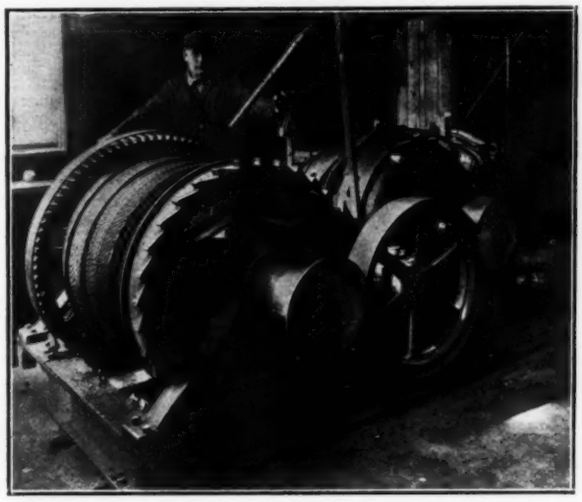


Fig. 5.—Motor-Driven Hoist Used in Tunnel Work.

To have utilized steam power would have necessitated a much larger initial investment in the construction plant, also more room than was available at three of the shafts; it also would have involved probable complaints from nearby residents due to smoke from these plants. The decision to use electric power eliminated these objections and permitted placing the shafts where they were most logically required for proper construction of the tunnel. Three of the shafts are located in high-class residence districts. Use of electric power has made the plants practically unobjectionable to the residents. The use of electric power has also proven much more economical than the use of steam power would have been. It has also resulted in a more flexible arrangement, since it has been possible to add motors as new operations were taken up and to dispense with others or put them into other use as the requirements demanded. The supply of power, which is purchased from the

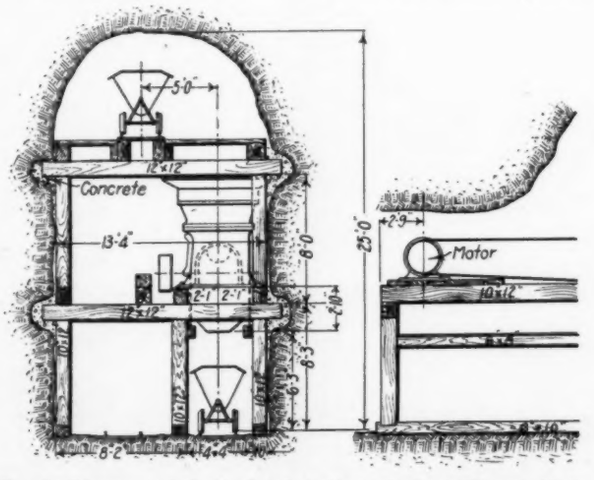


Fig. 6.—Diagram of Rock Crusher Near Foot of Tunnel Shaft.

Commonwealth Edison Company, has been found very reliable and altogether satisfactory.

Special supply cables bringing three-phase, 60-cycle, 4,000-volt current, are run to a bank of transformers mounted on poles close to each machinery house. These transformers are 75-kilovolt-ampere single-phase units which have been found by the central station to be best adapted for this power service.

At first a single one of these units was placed in each phase at each shaft and at the Mayfair shaft this has sufficed to carry the load. As the load increased at the other shafts another transformer unit was placed in parallel with the one installed in each phase. At the shore shaft, which has the largest load, a third transformer has been put in parallel into each phase, thus making a bank of nine units. The primaries of the transformers are connected in star and the secondaries are delta-connected with the middle point of one phase grounded. All motors used are 220-volt, three-phase machines connected through a distribution panel to the low-voltage line. The lamps in use in the tunnel and the head works at each shaft are connected through an autotransformer between the outer wires and a relatively small neutral so as to give a practically balanced load on each phase.

Motor-Driven Machinery.

The detailed power equipment at each of the four shafts is as follows:

Shore shaft.—Four 100-horsepower air compressors; two 50-horsepower blowers; one 50-horsepower hoist; two 75-horsepower and one 100-horsepower pumps; this makes a total of 800 horsepower connected motor load.

Lincoln Avenue shaft.—Three 100-horsepower air compressors; two 50-horsepower blowers; one 50-horsepower hoist; one 75-horsepower pump; the total connected load is 525 horsepower.

Lawndale Avenue shaft.—Three 100-horsepower air compressors; two 50-horsepower blowers; one 50-horsepower hoist; one 20-horsepower pump; one 50-horsepower crusher; total connected motor load 520 horsepower.

Mayfair shaft.—Three 100-horsepower air compressors; one 20-horsepower pump; total connected load 320 horsepower.

Mayfair pumping station.—One 90-horsepower hoist; two 50-horsepower hoists; connected load 190 horsepower.

On each of the four concreting machines there are two motors aggregating 13 horsepower. The total connected power load at the four shafts, in the tunnel, and at the pumping-station site amounts to 2,407 horsepower.

At the Mayfair shaft there was formerly in use a 50-horsepower blower, which has been taken out since the tunnel mining work carried on from this shaft has been completed. While this work was still under way, a 50-horsepower hoist was used in the shaft; this has been removed to the adjoining pumping-station site and is used in connection with the concrete tower.

Aside from the foregoing summary of the power load, there is a total connected load of something like 150 horsepower for lighting the tunnel, head works and pumping-station foundation work.

Tunneling Method.

The actual work of tunneling is divided into two main operations, the first being the mining of the rock and the second the lining of the rough bore with concrete so as to make a smooth and clean finished tunnel. For the mining it was decided to use compressed-air drills exclusively. The mining work is carried out on a two-shift basis, each shift working nominally eight hours. Each shift consists principally of two gangs, one of miners who set up and operate the drills which make the holes for the blasting and fire the blast, and the other of muckers who remove the rock thrown down by the preceding blast. Just before the end of the work of each shift the holes are filled with dynamite, and after every one has been taken up from the tunnel, the blast is fired. Several hours are then left for the smoke to clear, when another shift comes in to carry on the work. The mining has been carried on chiefly by what is known as the top heading and bench method, in which numerous holes are drilled in the upper portion of the tunnel and this blasted out before the lower portion or bench is mined. The tunneling carried on from the Mayfair shaft was on the three-shift basis, but no greater progress was made than on the two-shift plan.

Compressed-Air Supply.

The compressed air used for operating the drills is furnished by Ingersoll-Rand compressors installed in the machinery house at the top of each shaft. Each of these compressors has an automatic unloader. Each unit has a capacity of 600 cubic feet of free air per minute and compresses this to a normal pressure of 110 pounds per square inch. Each compressor is belted to a 100-horsepower slip-ring induction motor which drives the compressor through a short belt with belt tightener at a speed of 190 revolutions per minute. A general view of a battery of these compressors at the Lawndale shaft is shown in Fig. 1. These motors run at practically constant speed. They are provided with secondary resistances and a multiple-switch starter by means of which the unit is gradually brought up to speed.

The air is carried in a seven-inch steel pipe to a receiver 4 feet in diameter and 12 feet high. A six-inch steel pipe runs down from this through the shaft and branches in each direction in the tunnel to four-inch pipes. At first single units of each compressor group were operated for supplying air for drilling only, but since the concreting began, which requires a very large amount of compressed air, practically the entire battery is used at each shaft.

Since no troublesome amount of water is encountered while mining the tunnel, there has been no need of air locks and none of the work has been carried on under compressed air. This is another valuable feature resulting from building the tunnel through rock. Still another is the elimination of timbering before the concrete lining of the tunnel is put in.

Ventilation of Tunnel.

Special attention is being given throughout the tunneling work to adequate ventilation of the tunnel, which is being done on an exceptionally liberal scale. This is accomplished by means of the motor-driven blowers already referred to. There is one of these for each drift. Each of these units is a low-pressure General Electric centrifugal air compressor directly connected to a 50-horsepower squirrel-cage motor. It furnishes 5,000 cubic feet of air per

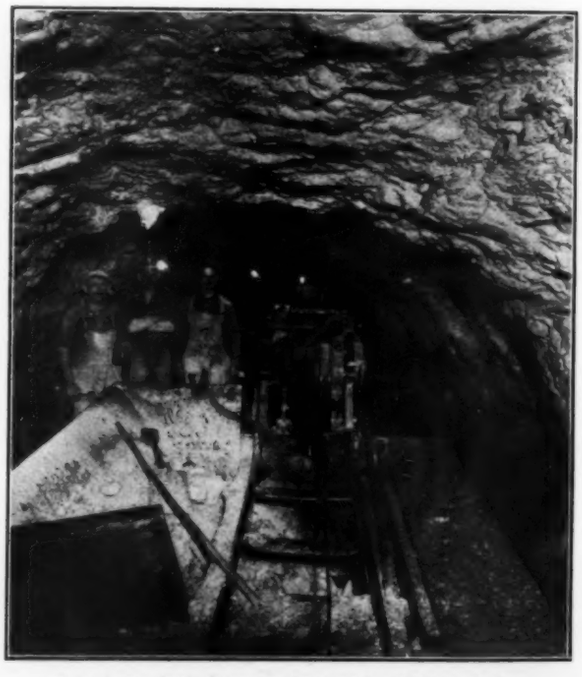


Fig. 7.—Portable Screening Machine, Motor-Driven.

minute at a pressure of 1.5 pounds per square inch. For the long drift under the lake two of these sets are operated in series to supply the air at 3 pounds pressure. A general view of one of the single sets is shown in Fig. 2. The control and instrument board, shown in Fig. 3, includes the starting compensator as well as recording and indicating instruments.

The air from these blower sets is passed over steam heating coils in winter so as to prevent chilling the men in the tunnel. The piping used to bring the air down the shaft and to the heading where the mining is going on is of No. 14 steel and 18 inches in diameter. It is in 20-foot lengths with special rubber-gasketed joints. Although light enough for two men to carry a length easily, it is strong and tight. This piping is strung at the side of the tunnel and steadily extended to bring it within about 100 feet of the heading. By means of an ingenious bypass and valve arrangement shown in the diagrams of Fig. 4, reversible operation of the ventilation is secured without reversing the blower or driving motor. Normally fresh air is supplied to the men at the heading as already described. For this purpose valves 1, 3 and 5 are opened and valves 2 and 4 closed. After a blast has been fired, the set is operated as an exhaust ventilator by closing valves 1, 3 and 5 and opening 2 and 4. This serves to withdraw from the tunnel rapidly the smoke and gases resulting from the blast. Before the next shift of workmen appears, the tunnel is quite well cleared and normal ventilation is restored.

Where the concreting is being carried on, additional ventilation is provided for the men on the screening and mixing machines by locally bleeding the high-pressure compressed-air system.

Haulage in Tunnel and Hoisting at Shafts.

The muck blasted at each heading is loaded into steel side-dump cars of one-cubic-yard capacity and hauled on a double-track tramway to either the concreting machine or shaft. This haulage was at first done by mules, but after the drifts increased in length several improved gasoline types of Baldwin mining locomotives were purchased and are being successfully used. It was not practicable to use storage-battery locomotives because of their requirement of direct-current charging equipment, and three-phase trolley locomotives would have required special trolley wires and track bonding.

The surplus rock not required for concreting is taken up the shaft by means of a Thomas electric hoist with single drum 32 by 24 inches. These hoists are operated by 50-horsepower slip-ring induction motors. One of these sets is shown in Fig. 5. They were designed for hoisting a load of 5,000 pounds at a speed of 200 feet per minute, but in actual service have exceeded this capacity. The trip of about 160 to 185 feet is easily made in less than a minute, including starting and stopping. The hoisting performance could have been even bettered by using the double-skip method, one load going up while the other goes down. Simplicity dictated use of the single skip, however, and it has given entirely satisfactory service. Hoisting is done on two parts of line over 30-inch sheaves in the head house, a three-quarter-inch steel cable being used. These hoists serve for all of the hoisting done in each shaft.

Drainage Pumps.

Each drift of the tunnel has a gentle slope toward the shaft from which it was driven and at one side there is a ditch which drains water to a sump at the foot of the shaft. Under and near the lake section of the tunnel there is some seepage before the tunnel is lined. Some of the rock drills use water to keep the hole clear of dust. To remove the water from the sumps motor-driven multistage centrifugal pumps are used. These pumps are of various sizes from the 300-gallon size up. They operate against a head of 150 to 160 feet and discharge into the street sewers.

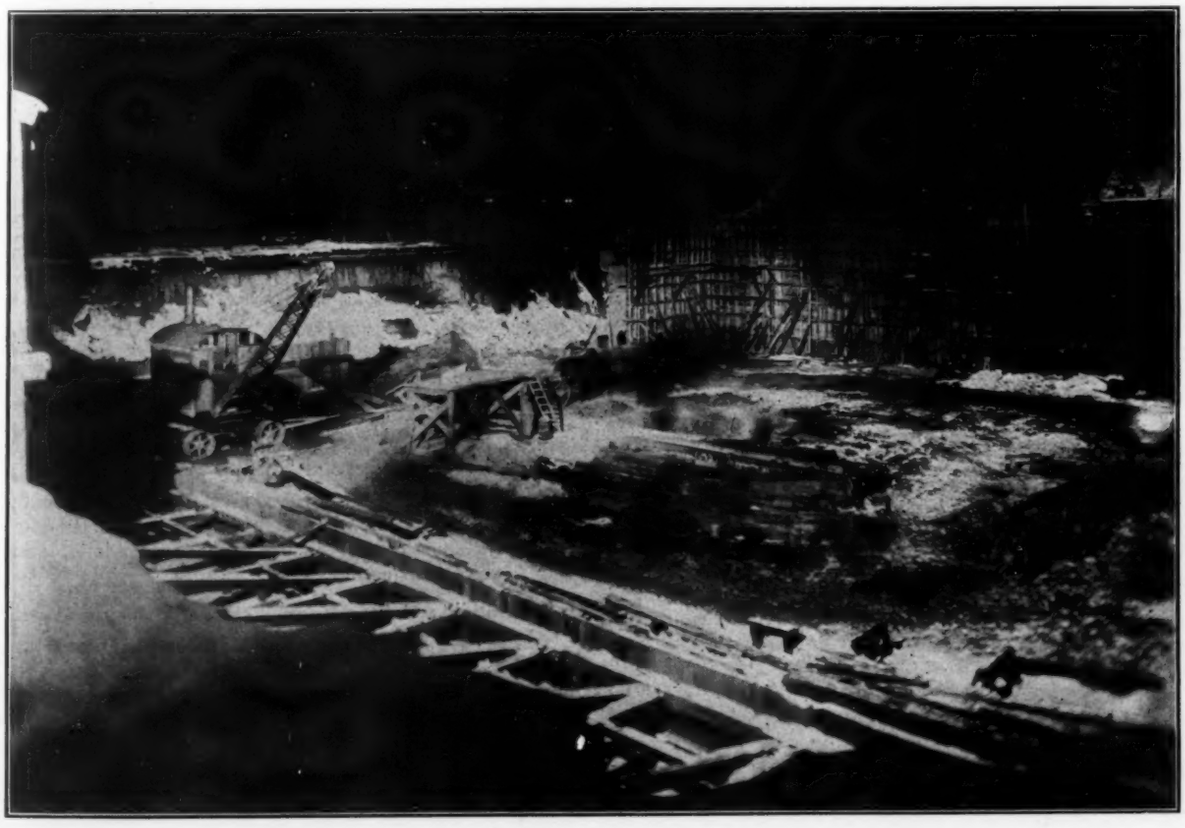


Fig. 8.—Flood Lighting Permitting Outside Work to be Done at Night.

Each pump is directly connected to a squirrel-cage induction motor with specially impregnated windings for waterproofing. The pumps operate at constant speed. The driving motors are of three sizes, 20, 75 and 100 horsepower.

Ingenious Concreting Process and Equipment.

Former practice in building rock tunnels was to do all of the mining before the work of concrete lining was done. This meant that all rock had to be brought to the surface and stored or disposed of. When concreting began the concrete had to be mixed at the surface, using either purchased stone or that which had been stored, and the mixed concrete was then taken down the shaft and brought to the lining forms, behind which it was put by hand. All this involved a great deal of duplicate haulage and hoisting of material and therefore heavy expense, besides consuming so much time that completion of the entire work was seriously delayed.

In order to hasten the work and also effect large economies in the cost of construction, the city's engineers conceived the idea of carrying on concreting while mining was still going on, direct use being made of the stone brought from the heading without hoisting it to the surface. After careful study showed that this plan was feasible, special equipment for carrying it out was devised.

This equipment consists of a portable plant compactly designed to be moved along one side of the tunnel without obstructing the other track which is left free for haulage of rock, supplies, etc. The plant consists of two parts, the first a screening machine and the second the mixing outfit. The screening unit has an incline upon which the cars are drawn up by means of a hoist driven by a 10-horsepower slip-ring induction motor. On reaching the top, the cars are dumped into the hopper shown in Fig 7, which also shows the hoist and the forward upper part of this machine. The stone drops onto a steel screen which has in it holes 4 inches in diameter. All of the stone below this size passes through this screen and falls on a conveyor belt which brings it up to the hopper on top of the mixing outfit. This belt is driven by a three-horsepower induction motor at a speed of about 150 feet per minute. The stone which is larger than 4 inches drops to the lower portion of the screen and is there placed into empty cars to be hauled up the shaft. From this brief description it is evident that the stone is not crushed or sorted in an elaborate manner, since the mine-of-run material brought from the heading contains a considerable quantity of fine stone which has been found to serve very effectively in place of sand in mixing the concrete.

The mixed fine and coarse stone brought by the conveyor to the top of the mixing unit is fed into a hopper of definite size, mixed with one-fourth of cement and then by opening a gate or valve is dropped into the mixer body. This mixer is not one of the revolving type which ordinarily is used for concrete mixing, but may more properly be described as a sort of churning machine. It is operated by the compressed air which is piped to it from the 110-pound pressure line along the tunnel. The air is introduced on top of the charge and churns it about in the body of the mixer which has a number of deflecting vanes. By opening the discharge gate this air pressure then forces the mixed concrete through an eight-inch steel pipe which carries it to the steel forms. This process has been found to work with entire satisfaction. The air pressure is sufficient to move a charge of mixed concrete through this pipe a distance as much as 700 feet, although a considerable amount of air is required for the purpose. In order to prevent too great a drop in pressure when a charge of concrete is driven through the pipe there are two air reservoirs, each of 14 cubic feet capacity, mounted on the same framework adjoining the mixing unit.

The mixed concrete is brought by means of the pipe referred to directly back of the movable steel forms, which are 30 feet in length and arranged with wheels to rest on a track and so that they can be moved ahead after the concrete has set. The work of placing the concrete behind the forms is done entirely by the air pressure referred to and the only manual work connected with it is the directing of the stream from the discharge end of the pipe. Two independent steel forms are used in each drift. One of these starts 700 feet from the concrete screening and mixing machine and is advanced 30 feet each 24 hours. The other form is about 350 feet ahead of this and likewise is advanced each day. Concreting is carried on in two shifts at the same time that the mining is done. One steel form is lined during each shift. At the end of 12 working days a stretch of about 700 feet is completed and then this concreting plant is moved forward 700 feet, being then anchored in place and connected with the compressed-air system. As soon as another 700 feet is lined in two weeks the outfit is again moved forward. All of this work goes on without interrupting haulage of muck or surplus rock and supplies through the tunnel, the steel forms being arranged to permit passing a track through the middle. These forms are made of structural steel and plates and also permit carrying the compressed-air pipe, the ventilating pipe, water pipe and electrical supply wires through the form.

When the concreting began, there was just about enough rock left unmined in the tunnel to furnish the stone needed for all the concrete lining. In the western portion of the tunnel the mine-of-run rock brought from the heading is about one-half made up of lumps over four inches in size. Since it was necessary to use this rock, a gyratory crusher was installed close to the foot of the Lawndale Avenue shaft. This is belt driven by means of a 50-horsepower induction motor, the arrangement being as shown in Fig. 6. The lumps screened out at the concreting plant operating east of Lawndale Avenue are dumped into the crusher and the crushed stone fed directly into the concrete mixer that is lining the completely mined drift between the Mayfair and Lawndale shafts.

There are four concreting plants in service, one operating eastward from each shaft. Mining is going on in three drifts, from 20 to 22 feet being mined in each drift per day. This is several times as rapid progress as has ever been made in similar work before. While the mining is going on, about 60 feet is lined in each drift per day. On previous tunneling work of similar character only 30 to 35 feet was lined per day. This rapid progress on the Wilson Avenue tunnel will insure its completion fully a year before the estimated time. Its cost will also be materially lower than that estimated.

Wiring System in Tunnel.

As already referred to, the wiring in the tunnel is a four-wire three-phase system, using as a rule a No. 8 wire for the neutral wire and heavier phase wires depending on the load. Rubber-covered cable is used and mounted on insulating cleats supported on wooden blocks secured to the rough or finished walls. No trouble at all has arisen from this wiring, which has been found amply well insulated. Lamps are connected between the outer wires and neutral to balance the load between the phases. Voltage regulation for lighting has been found, on the whole, quite satisfactory.

Excavation and Foundation Work for Pumping Station.

Before work on the foundations for the new Mayfair pumping station could begin, it was necessary to dig the auxiliary tunnels connecting it with the present terminus of the Wilson Avenue tunnel. These tunnels form a loop connecting with the Mayfair shaft about 60 feet below street level. They were tunneled through clay. The northern portion of these tunnels, known as the suction tunnel, lies directly below the massive foundations of the pump room; it was therefore provided with steel lining

plates within which are heavy circular steel reinforcements, the concrete lining being put in after these were all in place. There are also two concrete-lined screen shafts. All this auxiliary work has been completed.

Work on the foundations proper began last September and has been carried on uninterruptedly throughout since that time, something over one-half of this work being now finished. There will be seven steam-driven pumps, four of 25,000,000 gallons per day capacity and three of 15,000,000 gallons. All these pumps will set on the floor of the pump room which will be some 40 feet below street level. The total excavation therefore required involved digging a pit about 120 by 240 feet and at first about 20 feet deep, this corresponding to the boiler-room subbasement. At the edges of this the foundations for the outer walls, stack and coal-receiving room have been carried to a much greater depth and include a considerable number of caissons reaching hard pan. A large part of the outer foundation walls are already concreted. When these walls are brought up to ground level the prism or core now left below the pump room will be dug out to a depth of about 45 feet.

In order to carry on this excavation throughout the winter, work was done both day and night. Excavating was done by a steam shovel which dug directly down to the present general level of 18 or 20 feet below ground surface. By keeping continually at work and breaking up the ground from below no serious difficulty was met from frost. The excavated material was hauled away in wagons that were pushed up the incline by means of a 50-horsepower electric hoisting gear. At the end of the hoisting cable was connected a rugged car with a heavy protruding bar that was placed against the rear axle of the wagon. The hoist was started and pulled up the car, which pushed the wagon ahead of it. This rig worked very satisfactorily, as it eliminated delays due to hitching on and unhitching the cable.

A 90-horsepower electric hoist is also used for operating a steel derrick that hoists timbering, reinforcing rods, sheeting, concrete chutes, etc., about the work. Nothing but very small and light material is moved or lifted by hand. For lifting concrete to the top of the tower from which it is spouted to the various concreting forms there is used the 50-horsepower electric hoist that formerly was employed in the shaft.

One secret of the rapid and uninterrupted work done at the station site during the last eight months is the flood lighting provided for the night work by means of two "Sunlight" projectors, each with a 1,000-watt type C Mazda lamp. These are mounted on top of the adjoining machinery house for the shaft and are arranged so that their light can be projected to flood light any portion of the entire site. If night work is carried on in a restricted space the illumination can be made very intense over that area, having a lower intensity about it. The light can also be so spread as to flood a very large area to a quite uniform intensity. By means of these two lamps work has been carried on freely at any portion of the grounds.

Electric Load and Cost.

The electrical energy is purchased at each shaft on what is called a Class C power contract for supply of low-tension alternating current. Each shaft has a maximum-demand meter and a kilowatt-hour meter, the monthly bill including a demand charge and a consumption charge. Naturally, on this basis the best net rate per kilowatt-hour is obtained by maintaining as nearly constant a load as possible so as to keep down the maximum demand and raise the load-factor to as near 100 per cent. as possible. All of the work on the Wilson Avenue tunnel and Mayfair station has been planned to secure the highest load-factor practicable with the best and most economical construction methods.

At times the work has been unavoidably delayed at some of the shafts. At the shore shaft the load is greatest and most continuous. In recent months the maximum demand here has been about 545 kilowatts and the monthly consumption about 250,000 kilowatt-hours. The highest load-factors have run from 60 to 70 per cent. The average cost of energy for the short shaft has been a little over one cent per kilowatt-hour. At the other shafts it has averaged nearer to one and one-half cents because of the lower consumption and load-factor. Throughout the Wilson Avenue tunnel and Mayfair station work the average energy charge has been about 1.3 cents per kilowatt-hour.

The entire cost of the Wilson Avenue tunnel will be about $3,500,000 and of the Mayfair pumping station about $1,375,000. Both these figures are below the amounts originally estimated.

The entire work is being executed by the Bureau of Engineering, Department of Public Works, City of Chicago. John Ericson is city engineer and at the head of this bureau. Henry W. Clausen, engineer of water works construction, is in active charge of all the construction work. Joseph F. Chinlund is electrical engineer responsible for design and installation of electrical equipment. Data in this article were kindly furnished by these gentlemen.

Electric Energy Distribution of the Pacific Power & Light Company.

The Pacific Power & Light Company, operating in Oregon and Southern Washington, has compiled an interesting tabulation of sales statistics for the year 1915, indicating the distribution of electric energy in its territory for the different classes of service. This summary, as follows, shows that 37.8 per cent of sales was for commercial meter power, with electric power for irrigation, 21.7 per cent, and metered commercial lighting, 16.3 per cent, coming next in respective order. It will be noted, also, that the distribution losses, and transmission and transformer losses totaled 8.8 per cent and 16.7 per cent, respectively, of the total output.

Class of Service	KWH.	Per Cent of Sales	Per Cent of Total
Commercial lighting, metered.....	5,508,020	16.3	11.7
Commercial lighting, not metered..	5,057,254	3.1	2.2
Commercial power, metered	12,782,903	37.8	27.1
Commercial power, not metered....	3,927,760	11.6	8.3
Power for irrigation.....	7,326,420	21.7	15.5
Municipal street lighting, arc.....	1,563,345	4.6	3.3
Municipal street lighting, incand..	590,615	1.7	1.2
Street lighting, private.....	100,526	.3	.2
Other public service companies....	984,248	2.9	2.1
Total sales	33,841,091	100.0	71.6
Used by gas department.....	123,864		.2
Used by water department.....	617,164		1.3
Used by railway department.....	451,105		1.0
Used elsewhere by company.....	96,000		.2
Total sales and use.....	35,129,224		74.3
Sold by power system.....	72,073		.2
Distribution losses	4,188,133		8.8
Feeder output	39,389,430		83.3
Transmission and transformer losses	7,908,789		16.7
Total plant output.....	47,298,219		100.0

Simple Method of Relieving Static Electricity in Printing Offices.

A simple and effective means of eliminating static electricity from paper being fed into a cylinder printing press has been devised by a pressman. To an old copper plate was attached one end of a copper wire, the other end being fastened to a steam pipe or radiator. The copper plate was laid between two dampened blotters and placed on the feed board beneath the papers being fed. This furnished a means of conducting the electricity to ground and relieved the "sticky" characteristic sometimes found in coated or calendered paper more particularly, causing much trouble in feeding the sheets.

Lighting of a Modern Photographic Studio

Use of the White-Flame Arc Lamp for Portrait Photography and Description of a Typical Studio in Which It Is Used

By V. A. Clarke

IT IS said that every engineering problem is possible of more than one correct solution. This article is not written as the only true solution of the very live problem of studio lighting, but as a solution which is effective, though simple and inexpensive.

Modern photography has made lighting demands far beyond the possibilities of daylight to satisfy. Many of the portrait exposures have to be made in the late afternoon or evening when daylight is nearly or entirely absent, and

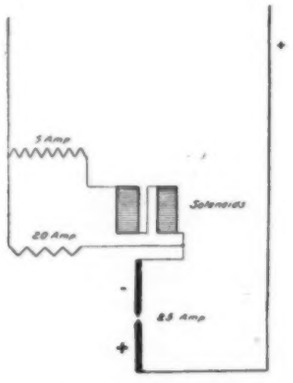


Fig. 1.—Circuit of Photographic White-Flame Arc Lamp.

even in midday the light is so variable as to preclude any certainty of duplication results. Hence, the illuminating engineer has been appealed to, with the result that every photographic exhibition shows better and better handling of this most important factor.

Artificial Illuminants.

The first artificial light to be used in the studio was the inclosed carbon arc lamp, at that time the foremost electrical unit for street lighting. Its disadvantages were many. Inefficient on a lumens-per-watt basis, it was even more so from a photographic standpoint. The inherent tendency of the arc to wander from side to side made the light far from uniform, and the predominance of blue and ultra-violet rays prevented a true rendering of color value, darkening the reds and intensifying the blues. Satisfactory portraits could not be obtained.

Within the last five or six years other artificial illuminants have largely superseded the inclosed arc. In the order of their importance these are the white-flame arc, the mercury-vapor lamp and the gas-filled tungsten bulb. All have merit and are useful in certain fields of photography. In this article no attempt will be made to enumerate the advantages and disadvantages of the two latter light sources. We will confine ourselves to a brief outline of the properties that make the white-flame lamp a desirable photographic unit and then describe its use in a modern portrait studio.

The White-Flame Lamp.

The factor of greatest importance to the portrait photographer is probably the quality of the light. We consider a print true in color when its lights and shadows correspond to the intensities of color of the subject as viewed by daylight. Hence, the nearer the photographic light approaches daylight in quality, the better will be the color of the finished print. Extended research with the spectroscope has shown that the white-flame arc gives an almost exact duplication of June sunlight through a blue sky. This also enables the photographer to correctly judge the proper length of exposure, accustomed as he is to daylight.

In order to render the readers the greatest possible service the writer has provided the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN with samples of the envelope described in this article, which will be mailed to those desiring to make a close investigation of this method or perhaps to have same reproduced for use in their business.

Equal in importance to the question of light quality is that of speed in portrait photography. To obtain a good likeness, the exposure should be made in approximately one-fifth of a second—one-half second is the limit. Facial expression is so sensitive to every passing thought that it is almost impossible for the average person to hold a natural, pleasing pose for more than one-half second. A longer exposure usually results in a blurring of the negative or else the face takes on a hard, forced look that is only too much in evidence in the finished picture. The flame arc, burning at 15 amperes or above, gives a greater

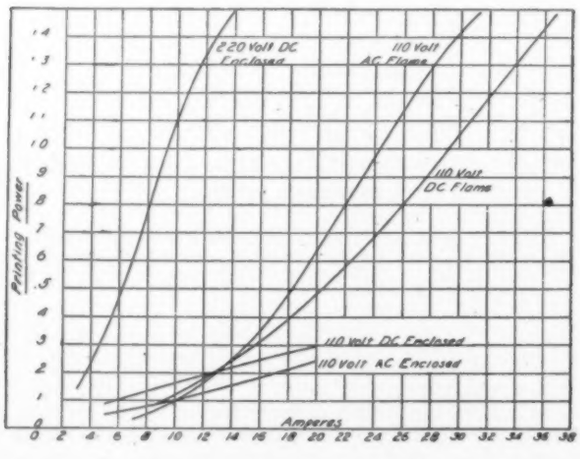

220 Volt DC Enclosed
110 Volt AC Flame
110 Volt DC Flame
110 Volt DC Enclosed
110 Volt AC Enclosed
Printing Power
Amperes
0 2 4 6 8 10 12 14 16 18 20 22 24 25 28 30 32 34 36 38

Fig. 2.—Comparative Printing Powers of Different Types of Arc Lamps.

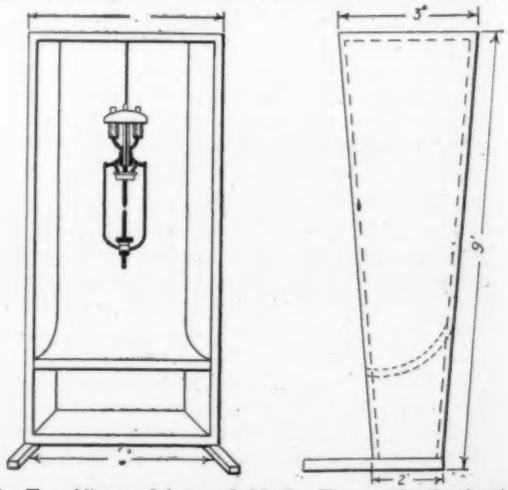


Fig. 3.—Two Views of Lamp Cabinet. Frequently the front and rear sides are parallel or even slope in the other direction.

speed per watt of energy consumed with one exception, than any other artificial illuminant, and with it exposures of one-fifth second can always be obtained. This exception is the 220-volt direct-current inclosed arc, which has been shown to be even more efficient, though lacking in the color value necessary to good portraiture.

With the flame arc exact duplication of results can be obtained. The writer has proved by many experiments, corroborated by the experience of photographers who have used the light, that at a given current the same photographic light is always given out, and that the slight flickering has no detrimental effects on the negative.

The Butler Installation.

As far as the writer knows, the first photographer in this country to appreciate the possibilities of the white-flame arc and to install it in his studio was A. N. Butler, of Cleveland, O. His success with this form of lighting has been such that he has recently located his studio in the heart of the business district and it is this studio that we purpose to describe. The studio proper is without windows and the only direct illumination is given by his flame-arc lamp.

The lamp itself is the same one that he installed more than five years ago in his original studio. It is one of the old Adams-Bagnall inclosed types, converted to burn flame carbons. This conversion was explained in detail in the *Electrical World* of November 14, 1914, from which the sketch accompanying Fig. 1, is taken. The procedure is, briefly, to change the polarity, making the lower carbon

Fig. 4.—Specimen Portrait Made with White-Flame Arc Lamp.

positive, and then to connect a suitable shunt around the lamp mechanism so as to carry a greater current than the coils would stand. The solenoids, carrying their rated current, will take care of the arc feeding and regulation, and the additional power going into the arc through the shunt, will be transformed into a steady, powerful light of daylight color and high actinicity. Especially designed flame carbons are used and the lamp operates without any globe. A glance at the curve in Fig. 2 (taken from the article mentioned above) will immediately show the increase in photographic power obtained by this transformation. At 15 amperes, the printing power, or in other words the actinic effect of the light on the plate, is nearly twice as much as that of the alternating-current inclosed arc at 15 amperes, and about 15 per cent more than the direct-current inclosed arc at that current. These inclosed arcs, however, ordinarily burn at about 5 amperes, so that at 15 amperes the printing power of the alternating-current flame lamp is six times that of the inclosed arc at 5 amperes. A comparison of the direct-current lamps does not show so great an advantage at low currents. The following table will indicate this even more clearly:

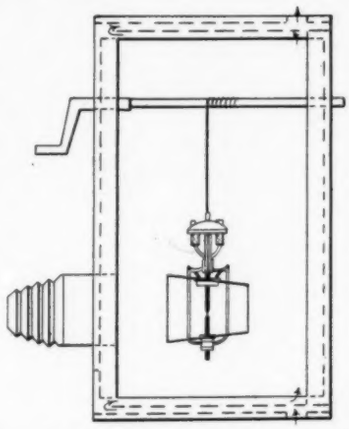


Fig. 5.—Diagram of Enlarging Cabinet. Light from Lamp Is Thrown Directly into Camera.

Amperes.	5	10	15	20	25	30
Alternating-current flame arc	....	....	.30	.63	1.05	1.42
Direct-current flame arc	....	....	.28	.48	.75	1.05
Alternating-current inclosed arc	.05	.10	.16	.25	.....	.....
Direct-current inclosed arc	.09	.16	.24	.30	.....	.....

As was stated before, the 220-volt inclosed arc gives a peculiarly high amount of photographic light. It must be remembered, however, that the terminal wattage is double that of the other lamps at equal currents so that, on a basis of equal power consumed, it is little better than the flame lamps and suffers considerably when compared as to quality of light.

The flame lamp is hung in a large wooden cabinet, shown in Fig. 3. The inside is coated with reflecting paint, and a curtain of thin white muslin or cambric, chemically fireproofed, is stretched over the front. This curtain effectively diffuses the light and gives a broad region of strong uniform illumination falling in a slightly downward direction upon the subject to be photographed. By suitably arranging opaque and reflecting screens all the modern lighting effects are easily obtained by the skilled photographer.

The posing is done in the studio under consideration at approximately six feet from the cabinet. At this distance, with a f 3.8 portrait lens, a normal exposure requires about one-fifth second, with the lamp operating at 15 to 20 amperes. A group picture which requires a greater distance from the cabinet can be exposed at the same speed by simply increasing the lamp current to 25 or 30 amperes by means of a rheostat. Fig. 4 is a specimen of the portraits taken by this light.

Other Studio Uses.

In Fig. 5 is shown an enlarging cabinet used in this studio. A converted arc lamp is used, equipped with a reflector which throws a concentrated beam of light direct-

ly into the back of an enlarging camera, and eliminates the necessity of a condenser lens. The cabinet is made of sheet metal and provision is allowed for air circulation as shown by the arrows.

The development of the photographic flame arc lamp has made rapid strides during the last year or two and there are now on the market at least six or eight different makes. Some of these lamps were shown for the first time at a recent photographic exhibition in the city of Cleveland. Their development has taken place along two lines: First, a stand lamp, evolved from the earlier photo-engraving lamps, used largely for spot illumination, and second, a hanging lamp, used for general illumination and in cabinets such as described. The feature of some of these new lamps is the use of a twin arc, i. e., two arcs in series. The natural arc voltage of the flame arc is in the neighborhood of 45; consequently, on a 110-volt circuit, 65 volts is lost in external resistance. With the two arcs in series, 90 of the 110 volts can be utilized as arc voltage, leaving only 20 volts to be consumed in resistance. Therefore, with the twin arc, 90 volts is used in delivered light against 45 volts for the single arc, while for either type of lamp 110 volts is paid for. The manufacturers of these lamps claim a light efficiency much higher than that obtained in the single-arc types of lamp.

In conclusion, the illuminating engineer is being called upon more and more to design the lighting for modern photographic studios, and this article is intended to give him a hint as to how it can be accomplished cheaply and efficiently. In the United States there are upwards of 60,000 portrait photographers, besides many exclusively commercial and motion-picture studios. The power they use for lighting is considerable and, being essentially off-peak load, is worth the consideration of central-station men in their attempt to fill up the "valleys" of the load curve.

Municipalities Negotiating for New Lighting Rates.—The Board of City Commissioners, Jersey City, N. J., has issued invitations to 138 cities in Hudson, Essex, Passac, Bergen and Union counties, asking officials to join its movement for a reduction in electric lighting rates now in force, such to be based according to the consumption in the different counties.

New Street-Lighting System for Salt Lake City.

Service has been established on lighting improvement district No. 1 in Salt Lake City. This is the first district to be lighted under the provision of the new law which was passed by the Legislature of 1915, which provided for the creation of lighting improvement districts and the installation of special lighting systems therein, the costs of which are to be assessed against the property owners according to the benefits derived.

This district embraces 16 city blocks and provides for the special lighting of approximately 2.5 miles of street. There are 218 four-ampere, pendent-type, luminous arc lamps covered by the contract for this service. This lighting improvement district comprises practically all of the commercial district of the city except Main Street, which is included in lighting district No. 2, which provides for a much more elaborate system. This latter system, however, is not expected to be completed for several months.

A four-ampere luminous arc lamp is supported by an ornamental bracket on each trolley pole on the street. The trolley poles are approximately 100 feet apart and the street between curb lines is approximately 100 feet in width so that a lamp is located at each corner of a 100-foot square throughout the entire course of the streets. This is equivalent to approximately 93 lamps or 30 kilowatts per mile of street lighted.

A law similar to the one under which this installation has been made appears to be by far the most satisfactory method of handling the special street-lighting problem. It overcomes most of the objections which have stood in the way of the success of most street-lighting schemes on a voluntary assessment basis. It enables the progressive property owners in the given business district to obtain a necessary public improvement in the same manner as they have secured sidewalks and gutter paving and similar public improvements in the past. It puts the burden of maintaining this improvement where it belongs, viz., on the property owner the value of whose property has increased by the improvement and who is able to obtain a greater return in the way of rent from tenants. It eliminates the troublesome feature of changing tenancy.

New Street-Lighting System at Salt Lake City, Utah.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

SPECTACULAR IRON CAMPAIGN IN DAYTON.

Special Bargain Sale Results in 1,175 Iron Sales in Course of Eight Days.

The six-day electric iron sale, conducted in August, 1915, by the Dayton Power & Light Company, resulted in 550 electric irons being sold in Dayton, Ohio. A similar sale was held from May 5 to 13 inclusive this year, which resulted in 791 electric irons being sold in Dayton (population 130,000), 149 in Piqua (population 15,000), 127 in Wilmington (population 5,000), and 108 in Xenia (population 10,000) making a total of 1,175 in the four cities in the eight days.

In 1910 the Dayton Power & Light Company discontinued the sale both of lamps and of other energy-consuming appliances. The local dealers were advised that in their interest the company would withdraw from the actual merchandising but would continue in its efforts to increase the popularity of electric household devices through the medium of advertising and direct co-operation with the retailers themselves. This co-operation has taken the form of newspaper publicity and the dissemination of advertising matter with the bills service, etc. The company's display windows have been given over to the use of the different dealers, a week at a time, to enable them to take advantage of the favorable location of the company's office and the circulation power of the big windows. At other times actual sales of apparatus have been conducted by the

Positively Only Three Days More
TODAY, FRIDAY AND SATURDAY
FOR OUR
Extraordinary Bargain
A Famous $2.00
Springer Folding Ironing Board
Will Be Given FREE With Each
Westinghouse Electric Iron
At 38 South Main Street
$3.50 Buys an Electric Iron guaranteed for life and the Folding Ironing Board--50 cents Cash and $1.00 on the first day of June, July and August.
Visit Our Electric Shop or Office and Order One at Once
The Dayton Power & Light Company
38 South Main Street ——— and ——— 50 South Jefferson Street

One of the Newspaper Advertisements Used During Campaign.

light and power company, and a commission of 50 cents has been paid to the dealers on every designated device sold during the period. The plan has worked well, and the increase in the use of these off-peak appliances has been satisfactory.

Only on the two occasions above mentioned has the company deviated from this co-operative policy.

The campaign in Dayton in 1915 featured a special demonstration and sale of a full line of heating appliances

Automobiles with Borrowed Trailers Delivering Irons Sold During Campaign.

with an experienced lady demonstrator in charge of a temporary electric shop, located on one of the main business streets of Dayton. This year's campaign, however, was an "out-and-out" bargain sale proposition and was conducted in Piqua, Xenia and Wilmington the same time as in Dayton.

Before commencing the sale in Dayton the company discussed the matter with the leading electrical dealers and received their consent to carry out its plans.

One thousand electric irons were purchased from the Westinghouse Electric & Manufacturing Company early in February and plans made for the sale to commence Friday, May 5, and to continue until Saturday evening, May 13. Saturday was by far the best day in August, 1915, and therefore the dates this year were arranged so as to provide two Saturdays.

Realizing from past experience that the American housewife "dearly loves" a bargain, 1,000 No. 3 folding ironing boards were purchased, and one board was given with each iron. The two articles were sold for $3.50, the regular retail selling price of the iron, either for cash, or 50 cents with the order and $1.00 on the first day of June, July and August.

A four-page folder, featuring the proposition as a special bargain, was printed and distributed a few days previous and during the sale to all the residential customers of the company, and in addition in Dayton considerable space was used in each of the daily papers every day of the sale. Liberal use was also made of the newspapers in Piqua, Xenia and Wilmington and in the latter two cities slides were used in the motion-picture theaters.

In Piqua, Xenia and Wilmington the irons were sold at the office of the company and by means of calls on all

residential customers. In Dayton, however, all the irons were sold at the company's main office or at the temporary store opened on Main Street, about half a block from the center of the city.

The temporary store was tastefully decorated with palms, etc.; no other appliances or articles were shown, however,

Temporary Store of Dayton Company Where Irons Were Displayed—"Blue Beauty" Standing in Door Way.

but the electric iron and ironing board. Two colored maids were busy at all times ironing in the window. The temporary store was kept open from 8 a. m. until 6 p. m. each day, except on the two Saturdays, when the store was open until 9 p. m.

Considerable attention was attracted to the store on the opening day by co-operating with one of the ready-made clothing stores, and "Blue Beauty" driving up in her automobile and having faked motion pictures taken of her walking toward the store—being attracted by the colored maid ironing in window—becoming interested—going in store—having iron and ironing board demonstrated to her in window—her purchase of iron and ironing board, and leaving the store with the electric iron. "Blue Beauty" was an attractive girl dressed in men's clothes—advertising navy blue suits. Some idea can be formed of the crowd that watched the free show and went home that night at six and told of seeing "Blue Beauty buy one of those electric irons and ironing boards, the Dayton Power & Light Company were selling on Main Street," by the accompanying illustration.

A record of the daily sales in each city is as follows:

	Dayton	Piqua	Wilmington	Xenia
May 5	72	25	22	10
May 6	99	11	21	7
May 8	58	14	14	14
May 9	72	32	12	6
May 10	91	16	12	16
May 11	93	16	5	10
May 12	98	8	10	13
May 13	208	27	31	32
	791	149	127	108

Special attention was given to prompt deliveries. Electric irons and ironing boards sold in morning were delivered in afternoon, and those sold in afternoon, the following morning. A fleet of Fords and "borrowed" trailers was used in Dayton.

When the appliances were delivered, competent young men explained how to connect up and use the iron, took voltage tests to ascertain the voltage being delivered to customer's premises, so that changes could be made at once, if necessary, and then placed fuses of proper size, if required, on the iron circuit.

The company believes that the sale was successful because of the publicity it received, the premium, the easy payments and the prompt deliveries.

ADVERTISING ELECTRIC COOKING IN MINNEAPOLIS.

Effective Sign Viewed by 20,000 People Daily Cost But $10.

One of the ways in which the Minneapolis (Minn.) General Electric Company is advertising electric cooking is by means of the sign shown in the accompanying illustration, and it might be added that the publicity received from this display is largely responsible for the success being enjoyed by the company in popularizing the use of electricity for cooking.

The Minneapolis company is at present engaged in building an extensive addition to its general office building and when the construction company erected its office, which occupies the entire width of the sidewalk, immediately adjoining the electric company's building, H. E. Young, sales-manager of the Minneapolis General Electric Company, conceived the idea of utilizing the outside wall space for advertising electric cooking.

Referring to this sign, Mr. Young states, "I really believe that a conservative estimate of the number of people that pass by this billboard, which automatically makes them step from the sidewalk into the street, is in the neighborhood of 20,000 people per day, and there is no doubt in my mind that it would be practically impossible to buy the publicity we are receiving from this billboard. And, in addition to this, the billboard is so large that it is practically impossible for anybody to pass by this display without having their attention attracted, and although of course we are unable to trace any direct results through this medium, there is no doubt that it is one of the most important links in the chain by means of which we have been able to sell up to almost a hundred ranges."

STEP INTO OUR ELECTRIC RANGE
DISPLAY ROOM
220 Loeb Arcade
THE M.G.E. CO.
Cook With Electricity
Step Into Our Electric Cooking Bureau 220 Loeb Arcade
And See How Easy We Have Made It For You To
Cook With Electricity
The Minneapolis General Electric Company

Sign on Construction Office Which Is Viewed Daily by 20,000 People.

The total cost of the display was only $10.

One Year of House Wiring in Topeka

Topeka Edison Company Conducts Comprehensive Campaign for 12 Months, Resulting in the Wiring of Over 2000 Homes —Details of Campaign With Data on Cost to Company

THE house-wiring campaign conducted by the Topeka (Kan.) Edison Company, has just registered one year of continued success. Two-month and three-month campaigns are many and successful but the one year continuous successes are far less in number. The Topeka campaign was started April 5, 1915, and continued with unabating success for one year and is still in progress, the data accompanying this article being from April 5, 1915, to April 4, 1916.

Topeka is a city of 45,000 population, having natural gas, at 28 cents per 1,000 cubic feet and electricity at 7 cents per kilowatt-hour.

It has been served with electric service for about 30 years.

The campaign was in sole charge of Robert B. Basham of the Illinois Traction Company. Four solicitors constituted the field force known as, "The Flying Squadron."

R. B. Basham, Who Conducted the Record-Breaking House-Wiring Campaign for the Topeka Edison Company. Mr. Basham is General Contract Agent for the Company.

The Topeka Edison Company did no interior wiring but took the contracts and sublet to the contractors, a schedule having been arrived at, at which electrical contractors accept orders from the central station.

Six monthly payments were the standard terms, although on contracts of $75 or over, longer time was allowed if asked for by the prospect. Ninety per cent were within the six-month terms.

Credit was carefully watched, no contracts being passed where payment looked doubtful and this is thoroughly evidenced by the fact that out of approximately 1,600 accounts, not 16 are dead ones.

The salesmen of Basham's "Flying Squadron" work on a self-sustaining salary and commission basis. The central-station salesman secures the order at a figure higher than the schedule to the contractor. The salesman shares in this margin, thus giving him an incentive to secure fair prices for contracts taken, the salesman's commissions being 30 per cent of the profit. No commission if no margin.

The publicity part of the campaign consisted of a full-page ad to start out, then gradually dropping down to about 12 inches for two week days in one paper and 24 inches on Sunday in the other, there being two good daily papers in Topeka. This advertising was continued throughout the entire year.

Direct-by-mail letters were used effectively at various intervals. Especially is this true of that part of the campaign directed to reach the owner of rental property. The landlord is the hardest one to convince but once in line, he is a good booster. The landlord campaign was a grand success and an outline of same is given herewith. It has been the experience of the Topeka company that correspondence should bear on local conditions if possible. This is noticeable in the landlord letters. The following was the publicity used to interest this class of prospects.

Bulletin on street car, "Keep That Tenant. Wire His Home For Electric Service."

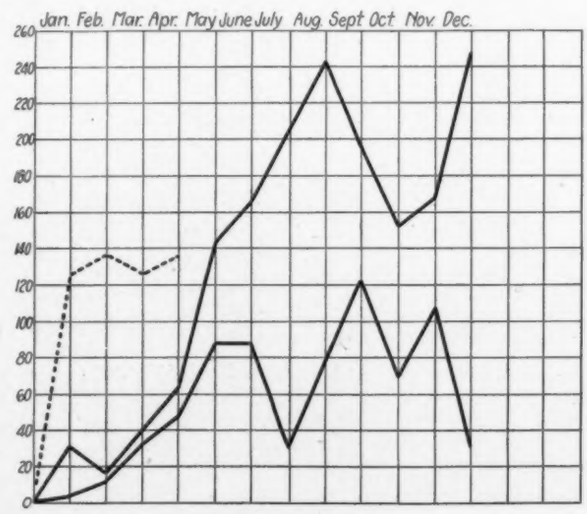
Card in street car, "Ask The Good Landlord To Give You Electric Service On The Wire-Your-Home Plan."

Two letters on wiring homes for renters.

Advertising in newspapers, "Electrified Homes For Rent."

A typical letter to owners reads as follows:

"A wire in time saves tenants. Do you use electricity in your home? Do you not think your tenants would appreciate the many electrical conveniences obtained through electric service if the house were wired just as much as you appreciate them yourself? Electric service, through the reduction in rate and the increased efficiency in lamps, together with the increased life of wall decorations and draperies, has proven to the real-estate man and the home owner that it is the most economical form of illumination for both the owner and renter. Anyone building a new house for rent, wires it for electric light. Why? For the simple reason it costs less to keep it in rentable condition. The wall and ceiling decorations will last from one to two seasons longer where electric service is used instead of flame lighting. No dirty black spots on the ceiling with electric service. If this applies to a new house, it also applies to one built for years.



Gain in Customers of Topeka Company.

"Is the house equipped for electric lights?" is one of the first questions asked by prospective renters and it is only a matter of a very short period when every rentable house in the city of Topeka will be wired for electric service or will be vacant.

"We are continuing our special house-wiring campaign for another thirty days. Why not let us make you an estimate on wiring your property and making it modern in this respect. You will save money—keep your tenant—and please everybody by doing it now. Estimates made free. You are under no obligations to us by asking for an estimate. Phone 4080 and ask for the Contract

NET GAIN IN METERS PER MONTH—1915-16

April 5 to April 19	45
April 20 to May 19	143
May 20 to June 19	166
June 20 to July 19	216
July 20 to Aug. 19	246
Aug. 20 to Sept. 19	195
Sept. 20 to Oct. 19	152
Oct. 20 to Nov. 19	166
Nov. 20 to Dec. 19	252
Dec. 20 to Jan. 19	125
Jan. 20 to Feb. 19	137
Feb. 20 to Mar. 19	125
Mar. 20 to April 4	65
Total net gain one year	2,033
Number of customers, April 4, 1916	7,171
Number of customers, April 5, 1915	5,138
Net gain for year ending April 4, 1916	2,033
Percentage net gain for year	39.5%

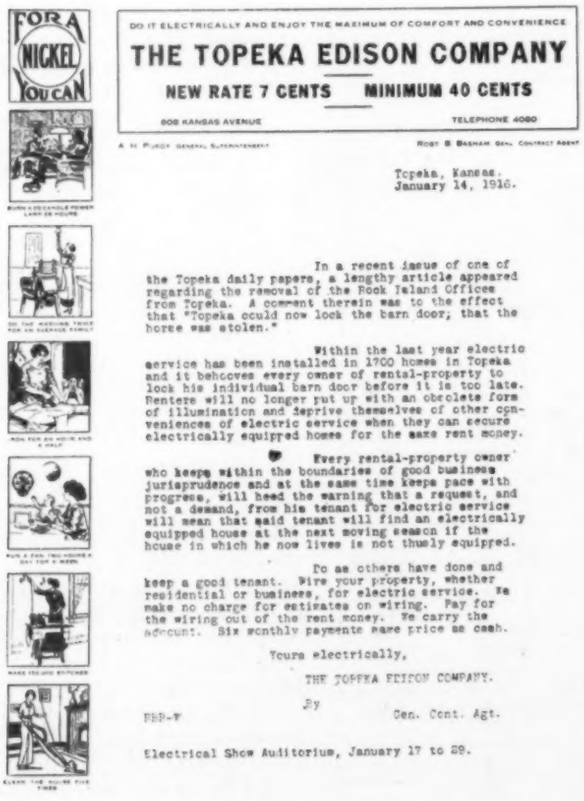
HOUSE-WIRING RECORD.

Total number of old house wiring contracts	1,512
Total number orders, poor credit and cancelled	177
Total number old house wiring jobs completed or awaiting completion	1,335
Amount business contracted—old house wiring contracts	$51,165.49
Amount business cancelled or poor credit	5,578.65
Net amount of business contracted	$45,586.84
Deducted for lamps and wiring costs	39,128.59
Gross margin	$ 6,368.25
Salaries of solicitors and stenographer for department	$ 4,151.34
Commissions, solicitors'	1,404.35
Total	$ 5,555.69
Net Margin	$ 812.56

Department. Get that estimate right now—Phone 4080. Yours for brighter homes."

Illuminated bill-board advertising was used to the extent of two 25-sheet boards in prominent locations.

The foregoing gives an outline of how the campaign was conducted. The accompanying tables give a complete summary of the results which were accomplished during the year.


FOR A NICKEL YOU CAN

DO IT ELECTRICALLY AND ENJOY THE MAXIMUM OF COMFORT AND CONVENIENCE

THE TOPEKA EDISON COMPANY

NEW RATE 7 CENTS MINIMUM 40 CENTS

808 KANSAS AVENUE TELEPHONE 4080

A. H. PUGSLEY, GENERAL SUPERINTENDENT ROBT. B. BRAHAM, GEN. CONTRACT AGENT

Topeka, Kansas.
January 14, 1916.

In a recent issue of one of the Topeka daily papers, a lengthy article appeared regarding the removal of the Rock Island Officee from Topeka. A comment therein was to the effect that "Topeka could now lock the barn door; that the horse was stolen."

Within the last year electric service has been installed in 1700 homes in Topeka and it behooves every owner of rental-property to lock his individual barn door before it is too late. Renters will no longer put up with an obsolete form of illumination and deprive themselves of other conveniences of electric service when they can secure electrically equipped homes for the same rent money.

Every rental-property owner who keeps within the boundaries of good business jurisprudence and at the same time keeps pace with progress, will heed the warning that a request, and not a demand, from his tenant for electric service will mean that said tenant will find an electrically equipped house at the next moving season if the house in which he now lives is not thusly equipped.

Do as others have done and keep a good tenant. Wire your property, whether residential or business, for electric service. We make no charge for estimates on wiring. Pay for the wiring out of the rent money. We carry the account. Six monthly payments same price as cash.

Yours electrically,

THE TOPEKA EDISON COMPANY.

By

Gen. Cont. Agt.

FBB-F

Electrical Show Auditorium, January 17 to 29.

Letter to House Owners.

RESULTS OF HOUSE-WIRING CAMPAIGN IN 17 CITIES.

1856 Houses Wired at Byllesby Properties During "Wire Your Home Month."

Seventeen Byllesby electric properties conducted a campaign for the wiring of already-built houses during the period March 15 to April 15, tying in with the national

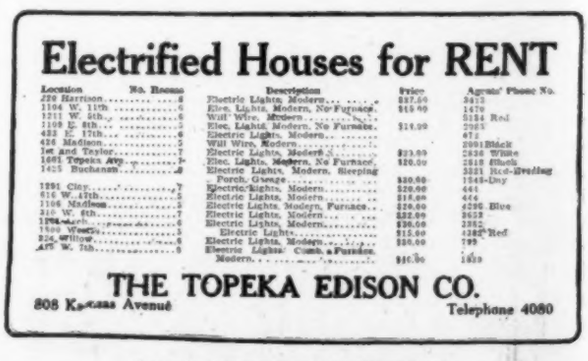
Typical Street-Car Card Used in Campaign at Topeka.

campaign promoted by the Society for Electrical Development. The 17 companies secured contracts for wiring 1,856 already-built houses. In addition, and as a result of the campaign, there were placed on the companies' lines nearly 900 household electric devices such as flat irons, table stoves, percolators, etc. The cities in which the Byllesby properties co-operated with the dealers in this wiring effort together with the number of contracts secured in each are as follows:

Louisville	701	Enid	35
Minneapolis	595	Faribault	29
Ottumwa	103	Mobile	22
Stockton	102	El Reno	22
Sioux Falls	59	Northfield	13
San Diego	58	Dallas	10
Oklahoma City	46	Sapulpa	9
Grand Forks	45	Albany	4
		Fort Smith	3

The wiring contracts and appliances sold represent an expenditure on the part of the public of $87,184, this being the total amount of money received by the various electrical interests engaged in the campaign.

The campaigns conducted, except at Minneapolis, were based upon time payments offered by the wiring contractors. In some cases reduced prices were made for the one-month period, and in others appliances were given away as premiums. Inquiries were secured entirely through advertising, principally newspaper space. Most of the properties, in addition to securing the contracts enumerated,


Electrified Houses for RENT

Location	No. Rooms	Description	Price	Agents' Phone No.
729 Harrison	6	Electric Lights, Modern	$37.50	3413
1104 W. 11th	6	Elec. Lights, Modern, No Furnace	$15.00	1470
1211 W. 6th	6	Will Wire, Modern		5134 Red
1109 E. 8th	7	Elec. Light, Modern, No Furnace	$14.00	2985
423 E. 17th	6	Electric Lights, Modern		671
426 Madison	5	Will Wire, Modern		2981 Black
1st and Taylor	7	Electric Lights, Modern	$23.00	2836 White
1601 Topeka Ave.	7	Elec. Lights, Modern, No Furnace	$20.00	2818 Black
1425 Buchanan	6	Electric Lights, Modern, Sleeping Porch, Garage	$30.00	3221 Red-Dwelling 1545-Dry
1291 Clay	7	Electric Lights, Modern	$20.00	441
616 W. 17th	5	Electric Lights, Modern	$15.00	466
1106 Madison	5	Electric Lights, Modern, Furnace	$20.00	4290 Blue
310 W. 6th	7	Electric Lights, Modern	$22.00	3653
1200 Woodlawn	6	Electric Lights, Modern	$30.00	2342
824 Willow	5	Electric Lights	$15.00	4382 Red
427 W. 7th	6	Electric Lights, Modern	$20.00	795
		Electric Lights, Comb. a Furnace, Modern	$40.00	1819

THE TOPEKA EDISON CO.

808 Kansas Avenue Telephone 4080

Sample Newspaper Advertisement.

secured valuable lists of prospects for future use, many of which will be closed during the present summer.

The campaign at Faribault is interesting in that it produced ten times as many contracts as a similar effort last fall, although it is usually conceded that fall house-wiring efforts are more successful than those conducted in the spring. The Faribault campaign last fall produced but three contracts.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

THREE REMARKABLE EMERGENCY SERVICE CONNECTIONS.

Availability of Central-Station Power Demonstrated by Sheboygan Railway & Electric Company.

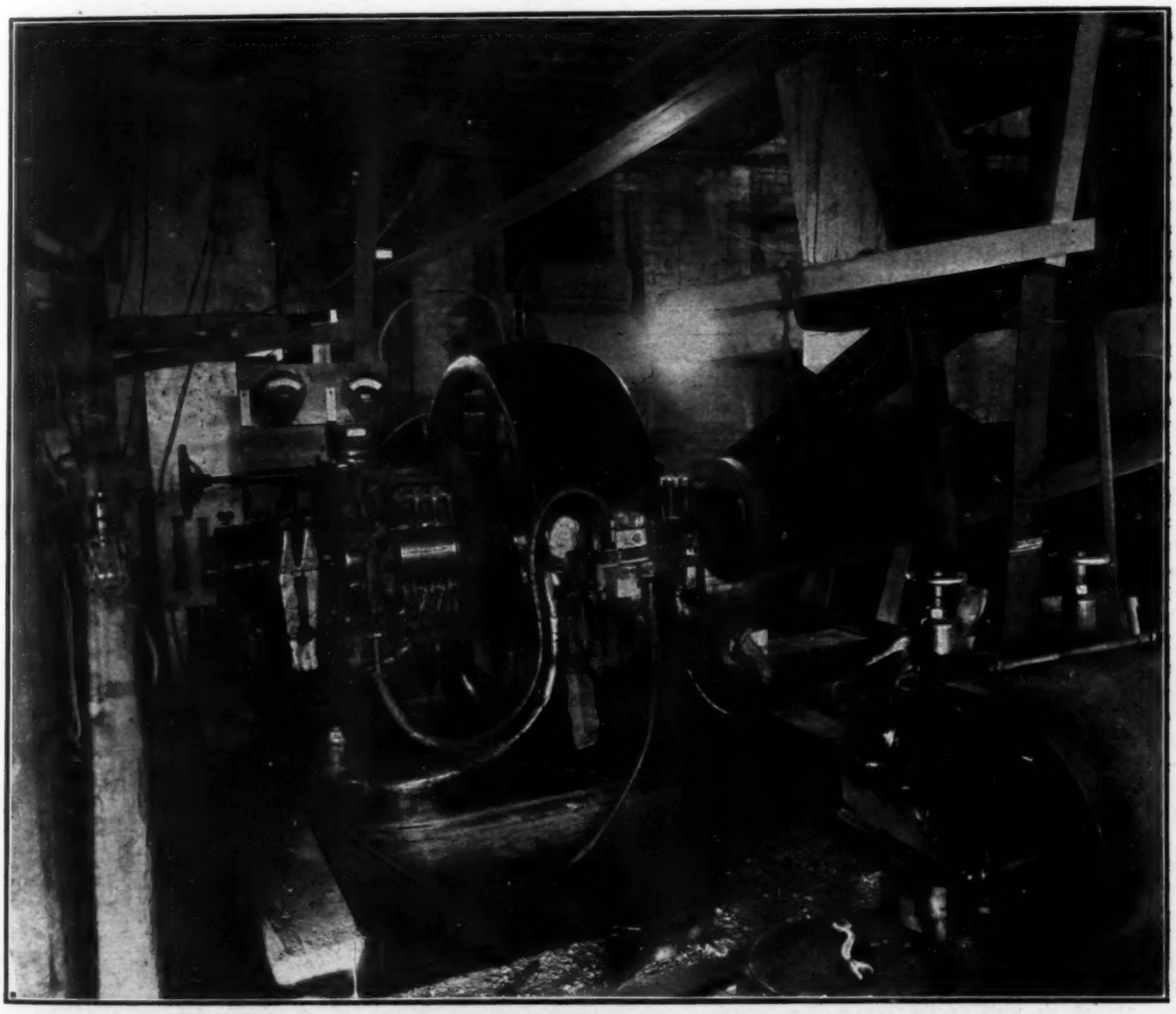
By Carroll H. Shaw.

One of the chief factors in the development of the central station has been its ability to adapt its service to every demand that is made upon it, and so steadily has progress in this adaptation been made, that it now requires some extraordinary undertaking to call the attention of its patrons to its possibilities.

One of the very usual calls upon the electric utility, especially in communities of from 10,000 to 40,000 population, is the prompt delivery and installation of small electric motors. Many companies find it profitable to maintain a stock of motors of various capacities with which to supply any emergency demands for electric power, and very frequently the calls for emergency service are from large manufacturing plants in which the isolated plant has been put out of commission by the failure of a boiler, engine or other piece of equipment that is required for the production and distribution of power.

The Sheboygan (Wis.) Railway & Electric Company has received during the past six months requests from three of the largest furniture factories in that city for temporary service. One plant was shut down for several days by the blowing out of the cylinder head of the engine. Inquiry was immediately made to the electric company as to the possibility of installing a 100-horsepower motor to operate the plant until the engine could be repaired, but upon learning that several days would be required to deliver and install so large a unit the matter was dropped.

The second call came from a large chair manufacturing plant, a portion of which had been operated by a rope



A 300-Horsepower Motor Installed in a Disabled Factory in 5.5 Hours by Sheboygan Electric Company.

drive extending outdoors between the two separate buildings. The load was estimated to be approximately 25 horsepower. The call was made on Saturday noon and on Sunday night a 35-horsepower motor was in place ready to operate the following morning. Its installation had required bringing the motor 20 miles on the company service car, the installation of the proper transformers, service lines, meter and all interior wiring. The success of this installation and the acknowledgment by the manufacturer of the improvement of the power in that portion of the plant, may lead to the complete motorization of the factory.

The third request, however, was so very unusual that the factory representative afterward admitted he had only made inquiry as a matter of trying "everything and anything." On Saturday night the fireman of a factory employing 600 men and running a 250-horsepower engine forgot to close the blow-off valve of his boiler and as a result he soon had nothing but a furnace full of melted tubes and warped boiler plant. At 3:00 o'clock on Sunday afternoon the electric company was asked if it could furnish sufficient power to run the factory for the following week.

It so happened that during the summer a new railway motor-generator set was installed at the power station and that a smaller 200-kilowatt, motor-generator set had been placed in storage during the winter, awaiting suitable weather to move it to one of the company's substations. The motor was rated at 300 horsepower, 2,200 volts, two-phase, four wire, but was a synchronous machine without starting equipment. It was direct-connected through a flexible coupling to a 200-kilowatt, 600-volt, direct-current generator running at 600 revolutions per minute, which had been operated as a motor in putting the set on the line.

It immediately became apparent that the installation of the alternator with a motor-generator exciter set and a suitable starting motor, was out of the question. The possibility of using the direct-current machine, which was already equipped with starting apparatus, was realized, however, and after a conference with the factory officials the electric company agreed to move, install and connect-up the generator as a motor and have it in operation on Tuesday morning.

The machine weighed approximately eight tons, but with the aid of a very efficient house mover, the machine was transported more than a mile and was running at 10:30 Monday evening. Local wiring contractors installed the necessary interior connections, while the construction crew of the company ran two 2/0 and two 1/0 feeders and return from the railway feeder line to the factory, a distance of about 600 feet. One of the other furniture factories placed two of their men at the task of making a wooden pulley with a 5.62-inch bore, 22-inch diameter and having a 25-inch face. This work was completed in 5.5 hours working time and was an excellent piece of work.

The entire equipment was ready for operation at 11:30 Monday night, except that the splice in the 22-inch endless belt was not dry. At 6:00 a. m. Tuesday morning, the motor was started and operated with entire satisfaction for 11 days, while the boiler was being rebuilt.

In the operation of the machine, it was necessary to use a water barrel as a starting switch since the original starting equipment was for no-load conditions, and when all the friction load was on the motor additional starting capacity was required. After the barrel was thrown all in, the starting switch was operated in parallel with it, before closing the circuit with a knife switch.

The accompanying illustration shows the manner in which the motor was installed. In the background can be seen the pedestal-type switches that were used at the power station as well as the volt and ammeter.

SOLVING THE HEATING PROBLEM AND SECURING THE POWER BUSINESS.[1]

By A. C. Shepherd.

Probably the one problem discussed more than any other upon the central-station power salesman's first visit to an isolated-plant owner to secure the power business, is that of the heating with exhaust steam. In some cases he not only believes the heating of his factory or building costs

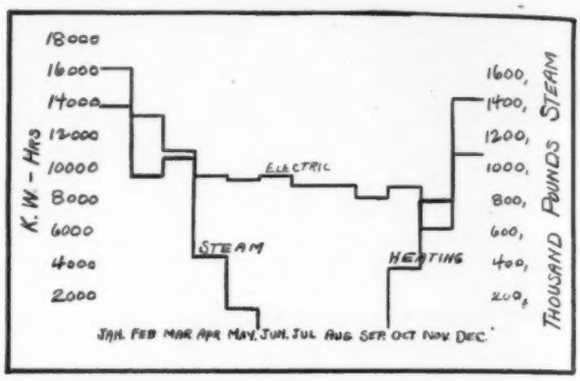


Fig. 1.—Steam and Electric Consumption of Knitting Mill.

nothing, but thinks, or has been led to believe that the power generated by steam equipment is a "by-product" and heating of factory the real cost of production.

It is this idea of the prospective customer that I desire to dwell upon, and by means of a set of curves solve the heating problem by showing that only a small part of the exhaust steam available is used, and what expense for the year could be charged to the use of exhaust steam for heating.

In Fig. 1 are plotted curves showing the purchased electric and steam consumption, month by month, over a period of one year, for a large knitting mill.

In Fig. 2 is plotted the average mean temperature per

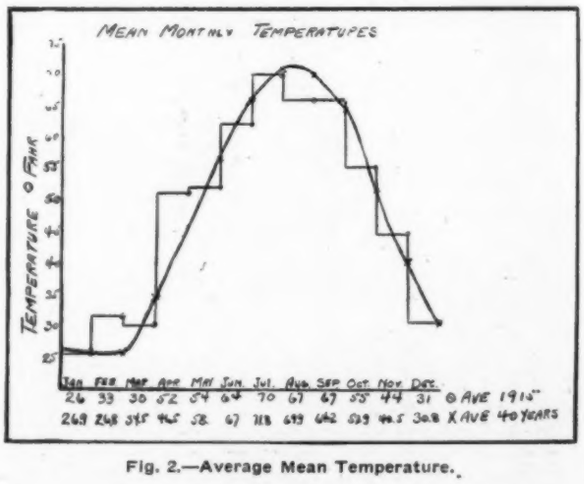

MEAN MONTHLY TEMPERATURES
TEMPERATURE © FAHR
Jan FEB MAR APR MAI Jun Jul Aug SEP Oct Nov Dec
24 33 36 52 54 64 70 67 67 55 44 31 © AVE 1915
269 248 345 465 58 67 113 619 662 523 405 308 X AVE 40 YEARS

Fig. 2.—Average Mean Temperature.

month for the year 1915, and the average for 40 years, showing little variation from one year to another.

In Fig. 3 are shown the steam requirements for an assumed plant operating 55 hours per week, and heating requirements over the same period. The temperatures used were the average over 24 hours for each day during the week of October 18, 1915, which was a typical mild winter month.

The total hours of heating during the week are 24 times

1 A paper presented at the convention of Committee on New Business Co-operation of the Ohio Electric Light Association, at Springfield, O., recently.

7, or 168, while the hours of plant operation are 55, or 32.8 per cent of the total time in which heat was required. While I have used 24 hours heating per day, the losses are not so great as when steam is entirely shut off at night.

Assuming an average power load of 100 kilowatts 55 hours per week and 50 pounds of steam per kilowatt-hour,

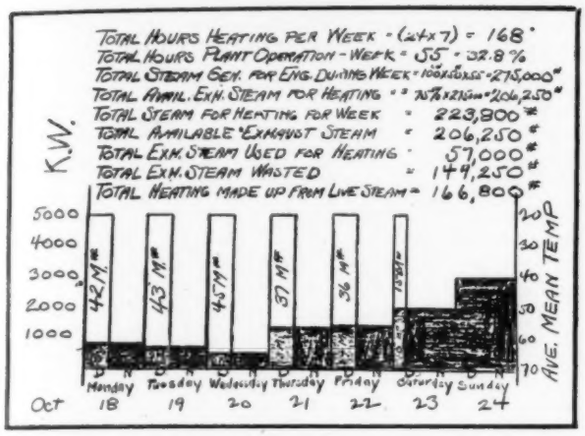

TOTAL HOURS HEATING PER WEEK = (24×7) = 168
TOTAL HOURS PLANT OPERATION - WEEK = 55 = 32.8%
TOTAL STEAM GEN. FOR ENG. DURING WEEK = 100 H.P. = 275,000#
TOTAL AVAIL. EXH. STEAM FOR HEATING = 75% × 21% = 206,250#
TOTAL STEAM FOR HEATING FOR WEEK = 223,800#
TOTAL AVAILABLE EXHAUST = 206,250#
TOTAL EXH. STEAM USED FOR HEATING = 57,000#
TOTAL EXH. STEAM WASTED = 149,250#
TOTAL HEATING MADE UP FROM LIVE STEAM = 166,800#
K.W.
5000
4000
3000
2000
1000
42 M#
43 M#
45 M#
37 M#
36 M#
AVE. MEAN TEMP
20
30
40
50
60
70
Monday Tuesday Wednesday Thursday Friday Saturday Sunday
OCT 18 19 20 21 22 23 24

Fig. 3.—Steam Requirements of An Assumed Plant.

the total steam generated for the engine per week would be 275,000 pounds.

Although the 50 pounds per kilowatt-hour would be high for a well designed plant, it is a conservative figure for the average existing isolated plant of 100 kilowatts average load.

Of this 275,000 pounds of steam only about 206,250 pounds would be available for use as exhaust for heating, due to losses.

Out of 24 hours each day for the first five days during the week, assume an engine operated 10 hours and supplied more steam than would be needed for heating, while during the remaining 14 hours live steam would have to be used. On Saturdays when the plant operated only five hours, live steam would have to be supplied the remaining 19 hours and for 24 hours on Sunday.

Of the 206,250 pounds of available exhaust, only 57,000

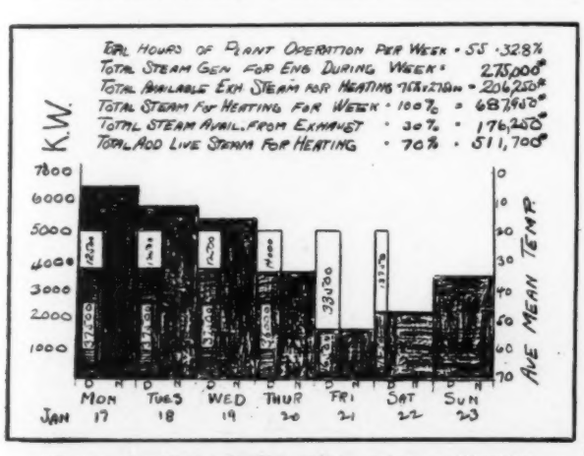

TOTAL HOURS OF PLANT OPERATION PER WEEK = 55 = 32.8%
TOTAL STEAM GEN FOR ENG DURING WEEK = 275,000#
TOTAL AVAILABLE EXH STEAM FOR HEATING 75% × 21% = 206,250#
TOTAL STEAM FOR HEATING FOR WEEK = 100% = 687,950#
TOTAL STEAM AVAIL. FROM EXHAUST = 30% = 176,250#
TOTAL ADD LIVE STEAM FOR HEATING = 70% = 511,700#
K.W.
7000
6000
5000
4000
3000
2000
1000
AVE MEAN TEMP
10
20
30
40
50
60
70
D N D N D N D N D N D N D N
MON TUES WED THUR FRI SAT SUN
JAN 17 18 19 20 21 22 23

Fig. 4.—Conditions During Week of Severe Weather.

pounds would be used during the time engine was running.

Of the 223,800 pounds required for heating during the week, 57,000 is exhaust and 166,800 pounds live steam.

Fig. 4 shows the condition existing during the week of January 17, 1916, which was one of the coldest weeks of the winter During this week 687,950 pounds of steam was required for heating. On account of temperature conditions 176,250 pounds of exhaust would be used of the 206,250 pounds available. The amount of live steam to be generated for heating during the week would be the difference between 687,950 and 176,250, or 511,700, or about 75 per cent of the total required.

Fig. 5 shows the divergence of steam heating and electric load for a large office building.

The steam required for heating certain class of buildings in Cleveland is shown in the following tabulations:

	No. of Buildings	Avg. Lbs. per Cu. Ft. per Season	Avg. Lbs. per Sq. Ft. per Season
Store and office buildings	10	8.4	645
Light Manufacturing Buildings	2	3.9	485
Department stores (large)	10	3.2	400
FACTORIES:			
Average pounds steam per cu. ft. per season—Direct Radiation = 6 pounds.			
Average pounds steam per cu. ft. per season—Indirect Radiation = 11 pounds.			

Another method of roughly estimating the amount of steam required for heating is to subtract the coal used by the isolated plant in the six summer months from the coal used in six winter months multiplied by two and the estimated evaporation factor of the plant.

This check, of course, would apply only where the greater proportion of the coal is used to provide power and the exhaust steam is used during day for heating.

The factor two is used on the assumption that the night heating, when engine is not operating, is approximately equal to the day heating.

We believe that from the data outlined above and on the charts, there is shown a method of determining the relation existing between exhaust steam and the total steam requirements of the power plant.

Also, that unless all of the exhaust steam can be used every day in the year, regardless of power-load conditions or temperature conditions, that an anlysis of the amount of exhaust steam actually used in the heating system will show the value of exhaust steam as a heating product to be overestimated in the average isolated plant.

There may be a little difference between the cost of coal for operating a high-pressure as against a low-pressure boiler, but the increased insurance, depreciation, upkeep, liability, danger of operation of all apparatus operating in connection with a high-pressure boiler plant and engine is a constant worry and trouble to the superintendent and manager of a plant.

Any live-steam requirements which could not be elimi-

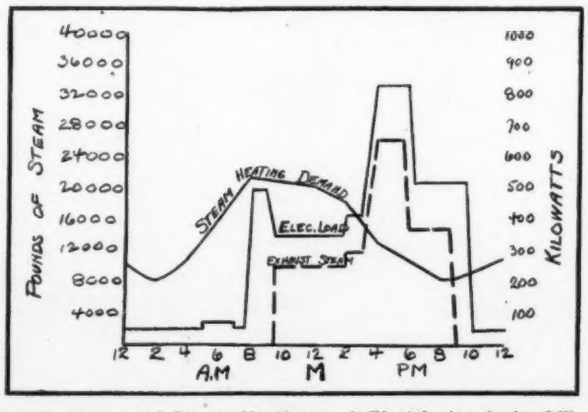


Fig. 5.—Curves of Steam Heating and Electric Loads in Office Building.

nated are often taken care of by small gas-fired upright boiler installed near the apparatus requiring live steam, namely, hot-water heaters, plating vats, cooking, etc.

The problem of heating a factory or office building with low-pressure steam is one similar to that of heating a large apartment house and can be operated at a low labor cost and without much incident worries or troubles.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

ELECTRICAL CONSTRUCTION AND EQUIPMENT OF A MODERN GARAGE.

Construction Features in Connection with Providing Facilities for Charging, Lighting and Power.

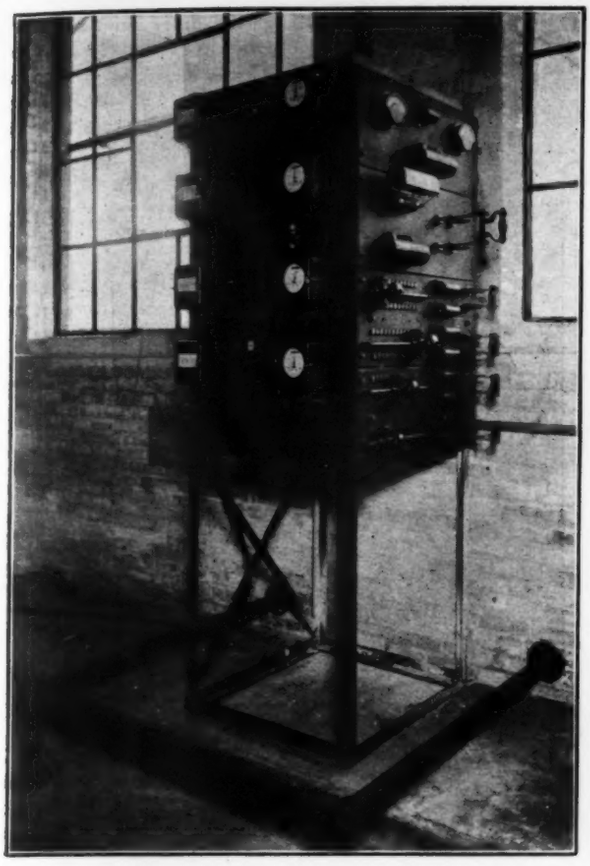
The great number of electric vehicles at the present time and the assurance that future increases in their number will even be at a great rate makes anticipation of the facilities needed to properly care for such vehicles a question in which a great amount of planning and discrimination is necessary. Based on the present outlook, garage service in the future will need amplification and many firms are now taking advantage of the opportunity for preparing to furnish additional service. The proper selection of garage sites, convenient to present and prospective customers, should be augmented by facilities for giving the very best service, which necessitates the installation of the most modern equipment.

The Rienzi Garage, 554 Diversey Parkway, Chicago, Ill., erected during the early part of 1916 and recently placed in service, is a garage designed primarily for service, with modern facilities for the storage and care of electric vehicles. It occupies a two-story fireproof building, 60 by 186 feet, of reinforced-concrete beam-and-slab construction. Arrangements were made in the building plans for an addition of two more floors when the increase in the demand for electric garage service taxes the present capacity.

On the first floor there are ample accommodations for the storage of 80 gasoline cars, and modern facilities for washing, repairing and general maintenance of these cars are provided. One of the conveniences on this floor is a turntable.

The second floor is used for the storage, charging, repairing and general care of electric vehicles, facilities being provided for 90 cars. The electrical construction in the entire garage, and especially on this floor, together with the electrical devices installed, is of more than usual interest. Energy for the entire building is supplied from the private power plant of the Lessing Apartment Building, which has a capacity of 2,000 kilowatts at 110 volts direct current. Four cables, each 600,000 circular mils in cross-sectional area, connect the main switchboard with the distributing panelboard on the second floor of the garage. In order to connect these two points, it was necessary to run the cables over the boilers in the apartment building, thence in 40 feet of tunnel crossing the alley between the two buildings and thence in pipe lateral to the second floor. These cables are in four-inch conduit the entire distance. Because of the

View on Electric-Vehicle Floor, Showing Distribution Panelboard and Charging Panelboards.



One of the Charging Panelboards.

proximity to the boilers and because they are adjacent to high-pressure steam and hot-water pipes in the tunnel, these cables were made especially for this installation by the Simplex Wire & Cable Company. The insulation of the cables over the boilers is 7/64-inch varnished cambric and double braided. In the tunnel conduit and pipe lateral the same insulation is used with the addition of a 5/64-inch lead sheath. A spare four-inch conduit is provided for future cables when the power requirements become greater.

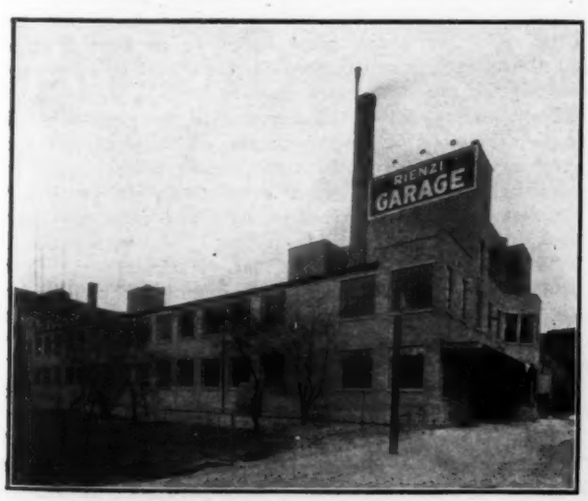
The four feeders, two of which are used for the incoming side of the circuit and two for the outgoing side, terminate at a 2,000-ampere, 250-volt knife switch in a Peerless distributing panelboard, which also contains three 800-ampere, 250-volt knife switches, one for lighting and power service and two for the charging panelboards. The main fuses for all distribution are also contained in this panelboard.

There are five Cutler-Hammer charging panelboards, each being equipped with control apparatus, rheostats, Weston voltmeter and ammeter, and plug receptacles for charging four electric cars at the same time. They are also provided with double-throw switches which permit the charging of a second group of four cars and metering the energy from the same panelboard. Each switch connects in circuit either of two meters, being connected in the positive legs of the circuits leading to the meters.

Referring to the accompanying illustration of one of the charging panelboards, the upper switch is the one controlling the entire board. Beneath this are the four specially designed switches that control the individual charging circuits. In addition to the main contacts, one of which is longer than the other, there are two other contacts made, depending upon the position of the blades. After batteries are placed in circuit for charging, the control switch is moved to make the first contact, which gives the voltage of the car batteries. Moving the blades to make the second contact, the line voltage reading is obtained. The operator then closes the switch on the first of the main contacts, which gives the ammeter reading of the charging circuit. This current is then lowered to the proper figure by the adjustment of the sliding-contact rheostat on the same side of the board, after which the switch is closed on the main contacts, which disconnects the ammeter, places the batteries on charge and connects in the wattmeter.

The reason for subdividing the charging switchboards into five separate units was to obtain economy in operation. This saving is accomplished by making it possible for the attendant to tend to the duties incident to charging while doing cleaning, repairing and other work on the car. After the car has been placed in position for charging, a specific-gravity reading is taken of the electrolyte in the batteries. This determines approximately what duration of charge will be needed. The attendant then places the batteries under charge, noting the time and the wattmeter reading on a blank form. He is then at liberty to give his attention to other work on the same car or to other duties.

Considering a typical case, if the duration of charge is estimated to be four hours and the charging current 25 amperes, the attendant may ascertain by referring to the blank form or by taking specific-gravity readings what the condition of charge is. When the batteries are nearly charged the attendant reduces the charging current to about five amperes for the finishing charge, usually given at this rate for about three hours and avoids buckling or sul-



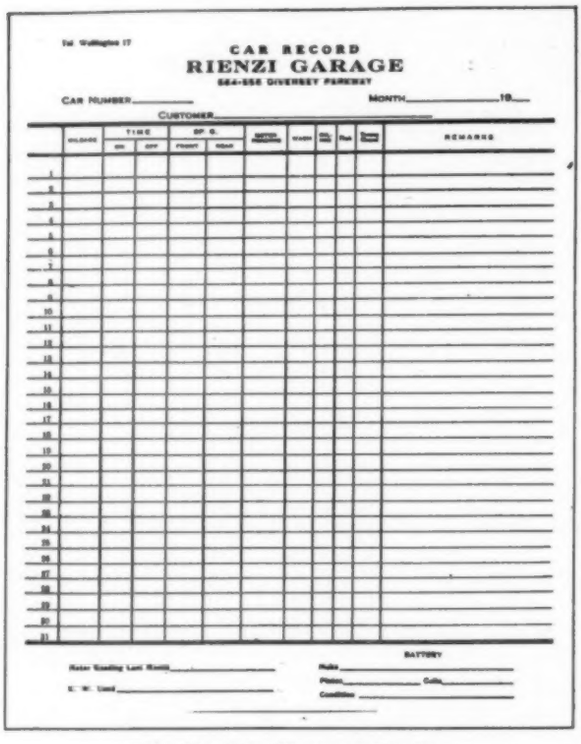
Exterior View of the Garage.

View of the First Floor.

phating the battery plates. The energy consumption is recorded by Sangamo watt-hour meters, eight meters being provided for each charging panelboard.

The owners of the garage have adopted a schedule of rates for measured service for electric vehicles and are advocating this class of service as preferable to the flat rate for storage and general maintenance. Unit prices have been fixed, such as $10 per month for storage and 40 cents for washing and polishing. Energy for charging is at the rate of six cents per kilowatt-hour for the first 100 kilowatt-hours used during a month, five cents per kilowatt-hour for the next 100 kilowatt-hours and four cents per kilowatt-hour for all in excess of 200 kilowatt-hours.

The data necessary for making the unit charges are placed on a car record sheet which is kept on a slate near each customer's car. Referring to the reproduction of this sheet, the first column is for the days of the month. In the second is placed the speedometer mileage reading. In the next two are placed the time when the car is placed on charge and the time charging was completed. The next two columns are for specific-gravity readings of the batteries when charged. The next column is for the watt-


CAR RECORD
RIENZI GARAGE
644-656 DIVERSEY PARKWAY
CAR NUMBER_____ MONTH_____ 19__
CUSTOMER_____
DATE | MILEAGE | TIME ON | TIME OFF | SP. G. RIGHT | SP. G. LEFT | WATTS | VOLTS | AMPS | Bat. | Temp. | REMARKS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
BATTERY
Meter Reading Last Month_____ Volts_____
K. W. Used_____ Plates_____ Cells_____
Condition_____

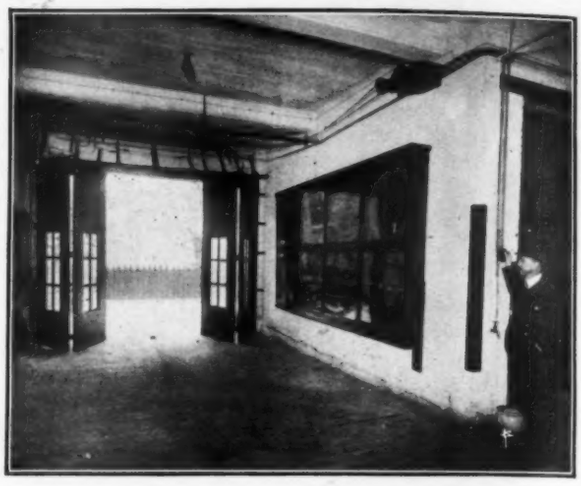
Data Sheet for Measured Service.

meter reading. The remaining columns are for other work to be done on the car. Each customer is provided with a separate wattmeter, which enables a check on the attendants' record. From data collected, it is found that the cost of charging varies from 1.1 to 1.8 cents per mile.

One of the charging panelboards is equipped with four meters, each of which can be used for measuring energy when transient cars are being charged. The control arrangement for these is the same as for the other meters. However, they have a large dial and resettable hand which registers the individual charge. The amount of energy can be read to one-fourth of a kilowatt-hour.

An elevator, with a capacity of two cars, semi-automatic control and driven by a 10-horsepower motor, is used for conveying the cars to and from the second floor. A tower was built so that the elevator is now arranged to give service to the third floor when it is added.

Of the electrical installations, the most unique is that of a Stewart door-opening and closing device. This device consists of a drum worm-geared to a 0.25-horsepower, 1,750-revolutions-per-minute series-wound motor, which together with the necesary cable and levers, accomplishes the opening and closing of the main-entrance door. The device is controlled from a number of stations, one being in the



Electrically Operated, Front-Entrance Door.

office and several located at different points on the first floor. Each station has three push-buttons, one for opening, one for closing and one for stopping the door in any position. An electric vulcanizer and an air compressor driven by a 0.25-horsepower motor are also installed in this garage.

The direct method of illumination is used in lighting the building. The wiring was installed for 60 200-watt outlets on each floor.

The electrical construction in the garage was engineered and installed by the Peerless Electric Company, 550 West Harrison Street, Chicago, Ill., under the direction of W. W. Ahlschlager, architect, 1744 Conway Building, Chicago, Ill.

Co-operation Among Kansas City Contractors.

The Magee-Reppell Electrical Company, a contracting firm of Kansas City, Mo., has made an arrangement with the Peerless Repair Company whereby it receives the electrical contracts on work picked up by the other members of the Peerless combination, which includes plumbers, carpenters, etc. There are six members, and the store of each has on its window the title "Peerless Repair Company Branch," with the number of the branch. The Magee-Reppell company's place is known as Branch 1; and all the electrical work taken by the Peerless company is done by this firm.

Two years ago W. R. Bump started the plan of providing a central office for the making of house repairs, from bricklaying and tin work to electrical repairs; six months ago the business had grown to such an extent that the Peerless company was incorporated, and various concerns brought into association.

"We realize, for one thing, that electrical repairs should be made by competent men, and preferably should be handled through a firm of contractors," said an officer of the Peerless company. "We have in busy seasons 20 to 25 men who do plastering, etc., but we employ no men for electrical work, turning all of that over to the Magee-Reppell Electric Company."

The Magee-Reppell company pays a percentage to the Peerless company on contracts given it, and receives a percentage on contracts for other kinds of repair work turned in to the Peerless company.

INFLUENCE OF GENERATOR SPEED ON COMPOUNDING AND COMMUTATION.

By Gordon Fox.

The speed of a prime mover is controlled by its governor. By adjustment of the governor it is possible to regulate the speed within moderate limits over a range of perhaps ten per cent of the normal value. In the case of engines or turbines driving alternators it is of course desirable that the correct speed be maintained, since the frequency of the generator depends directly upon the speed of the engine. It might be stated, in this connection, that not infrequently alternators in the smaller plants not equipped with frequency indicators, are operated below speed. Since the speeds of all the motors in the system are dependent upon the frequency, it follows that in such instances the motors run slow and may thus cause a loss in production. This feature is one worthy of investigation in plants where output depends largely upon maintained speeds.

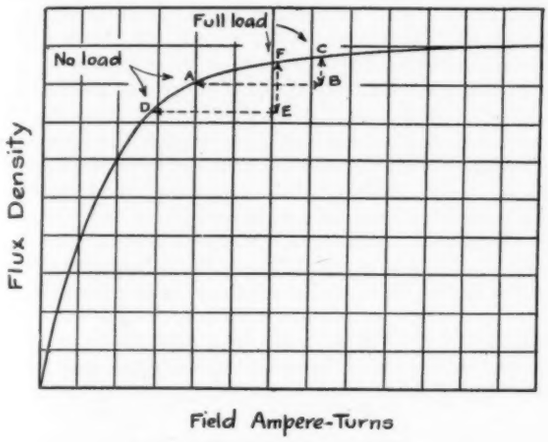


Fig. 1.—Magnetization Curve.

In the case of a direct-current plant, conditions are different. Here the motor speed is independent of generator speed, so long as the voltage is maintained. Moreover, since there is always some rheostat leeway for voltage control, it is nearly always possible to manipulate the rheostat to make up for any changes made in the speed of the prime mover.

Changes in the rotational speed of a direct-current generator may affect two operating features. The compounding will always be influenced to some extent and commutation may be either bettered or impaired, depending upon the nature of the change. We will first consider the relation between speed and compounding. In order to obtain stability of voltage the field coils of a generator are usually worked to a point a little above the knee of the magnetization curve. If the no-load normal-voltage point is below the knee of the curve, a slight drop in speed causes a decrease in voltage. This, in turn, decreases the shunt excitation and tends to lower the voltage still further, so that stability is questionable. The terminal voltage of a generator depends on the density of the field flux and the rotative speed, since these factors decide the rate of cutting the magnetic flux. It is evident that when the speed is increased the magnetic density may be decreased and vice versa, the terminal volts being maintained at a constant value. It is thus seen that the location of the no-load normal-voltage point on the magnetization curve depends on the speed. The series-field influence at full load is electrically represented by a definite number of ampere-turns. The effect which these ampere-turns may have upon the voltage depends upon the degree of saturation. If the no-load normal-voltage point be low on the curve, the series turns will have greater effect than if the iron is pretty well saturated at no-load magnetization.

Fig. 1 is the magnetization curve of a 230-volt direct-current generator operating at 250 revolutions per minute. The point A represents the magnetization corresponding to delivery of 230 volts without load at 250 revolutions per minute. The series ampere-turns are represented by the distance AB. The full-load voltage is higher than the no-load voltage by an increment BC, which represents the amount of overcompounding. Now let us assume that the generator speed is increased to 275 revolutions per minute. The no-load point corresponding to 230 volts at the terminals would now be lower on the curve, about ten per cent lower in fact, because the speed has been increased ten per cent. This point is shown in Fig. 1 at D. The same number of series ampere-turns at full load exist as before, the distance DE (equal to AB) representing this magnetizing influence. The overcompounding is here shown by the increment EF. It will be noted that the distance EF is considerably greater than BC. This means that the generator will overcompound to a greater degree when operated at 275 revolutions per minute than when driven at 250 revolutions per minute, other conditions being unchanged. The distance EF does not show the voltage rise accurately. It represents the increase in magnetic density from no load to full load. An equal increase in magnetic density will cause a greater increase in voltage at 275 revolutions per minute than at 250 revolutions per minute, so that the rise at the increased speed is, in reality, greater even than is indicated by this curve.

The corrected regulation curves are shown in Fig. 2. The curve for the generator operating at 250 revolutions per minute is here similar to the portion A to C of the magnetization curve shown in Fig. 1. This curve is not strictly accurate, as engine regulation, armature reaction and internal resistance tend to cause the voltage to decrease with load. The increase in terminal voltage due to overcompounding causes the shunt-field influence to be greater under full-load conditions. This latter factor about offsets those first mentioned, leaving the curve as shown nearly unchanged. The curve showing the voltage regulation of the generator when driven at 275 revolutions per minute is obtained from the portion DF of the curve in Fig. 1. The values are modified, however, by increasing the magnetic density increments, such as EF, by the ratio 275/250 to correct for increase in speed.

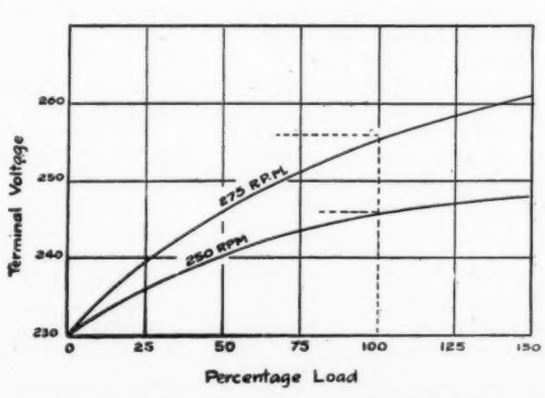


Fig. 2.—Voltage Regulation at Different Speeds.

It is evident from these curves that a change in the speed of a direct-current generator will materially change the compounding. If a generator is operated very much below rated speed it may be found that it has insufficient series effect to obtain the desired amount of overcompounding. If the generator is operated very much above speed it will likely be necessary to shunt part of the load current around the series fields to lessen their influence.

If a generator does not afford sufficient compounding, even when driven at rated speed, it may be possible to obtain the desired result by speeding up the prime mover. Operating below speed decreases the relative series-field influence, the ratio of series to shunt ampere-turns being low. Operating above speed increases the relative series-field influence, since the ratio of series to shunt ampere-turns is increased.

The portion of the magnetization curve over which a generator operates has an influence upon the amount of curvature of the voltage-regulation curve, and this may materially affect parallel operation. In Fig. 3 are shown two voltage-regulation curves of two generators having equal voltage rise from no load to full load. They are both equally overcompounded. But, at fractional loads, for instance at half load, there is considerable voltage difference. If these two generators were connected in parallel, machine A would take a greater share of the load at this point. In order to secure correct load division over the entire operating range, two or more generators must have compounding curves which are similar. As previously stated, the shape of the regulation curve depends largely on the portion of the magnetization curve upon which a machine operates. It was shown that speed changes cause a generator to operate over different portions of the curve. It is thus evident that by slight adjustments of prime-mover speed it is possible to modify the compounding curves in such a manner as to improve the

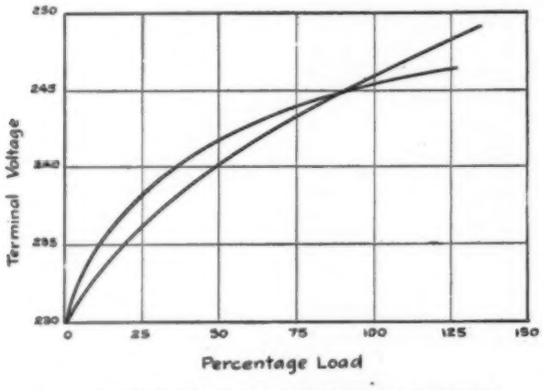


Fig. 3.—Voltage Regulation of Different Generators.

load division by causing the machines to have similar voltage-regulation characteristics.

The second effect upon operation due to speed change is in respect to commutation. A generator, driven above rated speed, will deliver rated voltage at a lower degree of magnetization than the normal value. This means that the field ampere-turns are reduced and the field iron will be worked at a lower saturation than normal. Since the armature magnetizing effect remains unchanged, its relative value or ratio to field turns is increased. This involves a greater shifting of the neutral with load changes and is unfavorable to good commutation. The full-load neutral will probably occur at a point further removed from the no-load neutral than is the case for normal operation. Relocation of the brushes thus becomes desirable.

In an opposite manner, if a generator be operated below rated speed the ratio of armature to field turns is reduced, the neutral becomes more stable and commutation is improved. Consequently, if a generator operating at normal speed tends to spark and it is found that the neutral shifts widely with load so that a single brush position will not answer for all loads, conditions may be improved by slowing down the engine or, in case of a belted machine, changing pulleys. The allowable speed reduction is limited by the ability of the machine to deliver rated voltage without cutting out the field rheostat altogether and by the compounding which, as was previously explained, is reduced with decrease of speed.

It may be mentioned that speed changes will also have an effect on the temperature of a generator. When operating at increased speeds the iron is worked lightly so that core losses are low. The increase in windage and ventilation also tends to cooler operation. In opposite manner, when the machine is operated below speed, it will tend to run warmer. The shunt field coils in particular will be affected, since more shunt ampere-turns are required to secure the desired no-load voltage.

Rapid Installation of Electrical Equipment for a Picture Theater.

Exceptionally rapid work was recently completed in the electrical installation for the Butler Theater at Ishpeming, Mich. This theater was designed to be completed by a certain day and the entire construction of the building and its equipment was finished in 59 days according to schedule. This theater was built for the Ishpeming Theatre Company and is a motion-picture house seating about 500 people. The building is 105 by 35 feet in outside dimensions and is devoted exclusively to the theater. Above the rear portion of the auditorium is a balcony.

The complete electrical work of wiring the entire theater and installing all of the electrical equipment for lighting, ventilation and picture projection was done by two men, an electrician and a helper. It was completed in 29 working days. The wiring is entirely in conduit throughout. Over the auditorium are 10 semi-indirect fixtures, each including four lamps. Three of these are 100-watt type "C" Mazda lamps for the bright illumination used at the beginning and the close of each performance; there is also one 40-watt tungsten lamp for providing the dim light which is maintained during the display of pictures. These fixtures are arranged to be lowered simultaneously by means of a single windlass with wire cables. At the outside of the exits are lights kept burning throughout the evening performance; these are installed in Newgard vaporproof receptacles. In the upper portion of the theater front are two 600-watt type "C" lamps. Along the cornice are 18 lamps to aid in outline lighting. There are also numerous lamps about the main entrance canopy, besides special fixtures in the office and lobby. On columns along the side of the auditorium are numerous wall outlets for use in connection with oscillating fans.

The operating room is in the rear of the balcony and has a large storeroom adjoining each side. It is entirely of fireproof construction. The two projecting machines are now operated from two Fort Wayne single-phase Compensarcs. A set of double-pole double-throw switches has been installed to enable the projecting machines to be thrown over to a direct-current supply from a type 14-T Wagner white-light three-phase rotary converter, which will be installed in the near future.

The architects of the building were Charlton & Kuenzli, of Milwaukee, Wis., and Marquette, Mich. The electrical work was installed by the Milwaukee branch of Henry Newgard & Company.

A Remedy for Low-Voltage Generator Trouble.

Many office buildings and the like use self-excited low-voltage generator sets for the call bells and annunciators. The load on these generators is exceedingly varying, going suddenly from no load to full load. When operating for long periods at no load the high contact resistance of the brushes and the oil film that covers the commutator will cause the voltage to drop. When the bells are in frequent use there is practically no difficulty in maintaining the voltage. As the absence of a load appeared to be the indirect cause of the trouble, a permanent load of a small lamp connected across the brushes has been successfully applied in several cases by the writer. R. L. Hervey.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

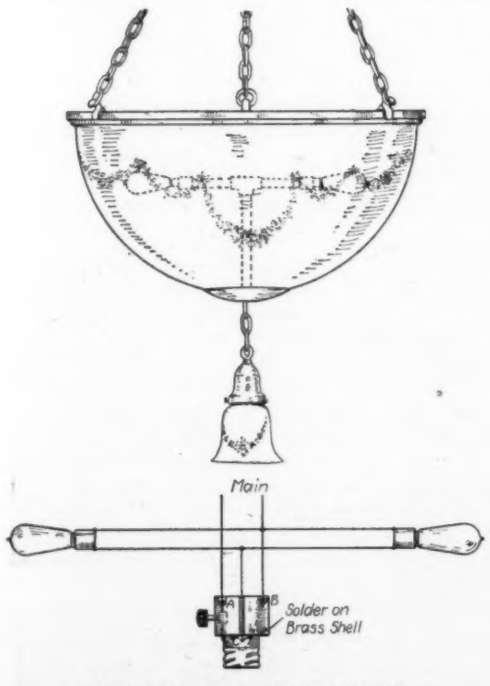
Cleaning Commutator Segments.

When rebuilding commutators, the mica between the bars is often found shellaced to the segments. This old mica and shellac should be thoroughly removed before the commutator is reassembled. The bars can be cleaned by scraping with a knife, but that is a long and tiresome job. A quicker and better method is to put the segment into a bath of alcohol until the shellac softens, then taking them out one at a time the mica can be easily removed with a wire scratch brush. R. L. Hervey.

Combination Socket and Switch.

I was recently called to an apartment in which there were two ceiling fixtures controlled by means of a single wall switch. One of these fixtures was in the rear of the apartment and was in almost continual use, whereas the fixture in the front of the apartment was lighted only occasionally. The only way to turn off the current from the front fixture was to turn the key of each individual socket separately which caused considerable trouble because two of the sockets were inside of the bowl, the arrangement being as shown in the upper part of the sketch.

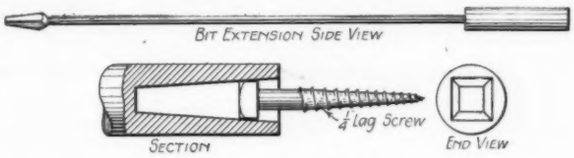
The owner wished the fixture in the front of the apartment to be controlled separately. He did not want any pendent switch hanging over the upper edge of the fixture, nor did he wish to do away with the single light at the bottom. The way I overcame this is shown in the lower part of the sketch. One of the wires going to the fixture was run directly to the key on the center socket *A*. The other wire was connected to one side of each socket in the bowl and to the center contact *B* on the bottom socket. I then tapped a short wire from the other side of the two sockets in the bowl and soldered it direct to the brass screw shell of the bottom socket at *C*. Now, by turning the key in this botom socket all three lamps in the fixture are controlled with one operation. Charles Stadmuller.



Wiring of Socket as Fixture Switch.

Fastening Cutout or Switch Boxes with Lag Screws.

In setting cutout boxes or switch boxes it is frequently the best plan to fasten them with one-fourth inch lag screws. This is especially true on concrete or brick walls where the lag screws are very much better than wood screws. Since the holes in the back of the box are usually set only about one-fourth inch from the walls of the box, it is almost impossible to use an ordinary wrench, and therefore I always use a five-eighths inch bit extension with a brace, putting the lag-screw head into the bit extension and using the same as an adjustable socket wrench. By this method it is possible to tighten up the lag screws securely without injuring the heads of same. Not only does this make a tight job, it also saves much time. H. L. Coutts.



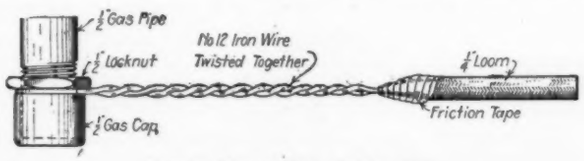
Bit Extension for Driving in Lag Screws.

Safeguarding Against Drilling Into Gas Pipes.

In extending some conduit work in an old government building, I had occasion to drill several holes through the floor, which consisted of wood laid on concrete. I was afraid of driving the star drill into the gas pipes and conduit imbedded in the floor. Therefore, I connected an extension cord from one side of a nearby lighting circuit and attached one wire to the drill, placing a lamp in series therewith. The other side of the circuit was grounded to the conduit and gas pipes. In one case the lamp lighted, showing that we had struck some of the buried piping and therefore had to seek a new location for the riser being put in. By means of this simple scheme we saved considerable trouble. J. B. Story.

Device for Soldering Pig-Tail Joints.

Much time and trouble can be saved in soldering so-called pig-tail joints by using a device such as that illustrated. Cut about two inches off the threaded end of a half-inch gas pipe. Screw a half-inch locknut on this threaded end until it is tight; then twist a No. 12 iron wire around the threaded pipe just below the nut; this is then twisted together to serve as a handle. At the bottom, screw on a half-inch gas cap. At the other end of the handle put on a short piece of quarter-inch loom held in place by friction tape to serve as a good grip and also as a protection against heat. This little device acts as a cup in which solder can be readily heated and with it a set of joints can be soldered in about one-fourth the time that is required with the ordinary soldering iron or torch and no solder is wasted in the process. J. McFarland.



Simple, Home-Made Solder Cup.

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
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H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The Eastern Massachusetts Section held its May meeting on May 19 at the office of the commissioner of wires, Boston, and was called to order at 2:45 p. m. by President Briggs. In the absence of the secretary, who was detained at home by illness, Inspector Blaisdell, of Everett, was elected secretary *pro tem.*

The principal matters for discussion were certain cases where taps had been found improperly made in molding; desirable arrangements for switches on electric ranges and heating devices; use of service switches and cabinets set in outside walls accessible from outside. An interesting example of service conduit, which had been burned out and caused a fire on account of spliced wires within same, was shown by Mr. Fuller, of Somerville. The Section will hold one more meeting before adjourning until fall.

The members of the New York Section met in the Assembly Room of the Municipal Building on Monday evening, May 22. The gathering represented inspectors from each borough office of the Bureau of Gas and Electricity, as well as the New York Board of Fire Underwriters. G. E. Bruen, superintendent of the Suburban Fire Insurance Exchange, presided.

The feature of the evening was a talk by Dana Pierce, chief electrical engineer of the Underwriters' Laboratories. Mr. Pierce presented a review of the work being performed by the Laboratories, showing the wonderful development from the small room in Chicago, wherein tests on electrical apparatus were first made 20 years ago, to the large fireproof structure of today, with its several branches in other cities.

To show the limit to which fireproof conditions are carried in the Chicago laboratories, it is interesting to note that in the offices even the picture frames are of metal, while it was suggested, in jest, no doubt, that a rubber plant, at present resting on a metal stand in the main office, should be made of asbestos. The apparatus used and the methods employed in testing, not alone electrical fittings, but also safety appliances, were explained in detail and illustrated at the same time with stereopticon slides. At the conclusion of his lecture, Mr. Pierce was still kept busy, as almost every inspector present had a question to ask, which, of course, proved how interesting was the talk to his hearers.

Joseph Dimes, inspector from the Manhattan office of the City Department, was the "operator" of the stereopticon machine, and the way he worked his dissolving effects on the slides lacked nothing of being professional, and his question, later, as to why porcelain devices are not glazed on the back, where most exposed to moisture, showed he had missed no part of the lecturer's talk.

The New York Section has now adjourned for the summer months, and there will be no further meeting until next October.

The Secretary most earnestly asks the members to send him a few questions for use in this department at once. He wishes to send a bulletin of questions to the Executive Committee shortly, and has only about half enough material. This is not because questions have not been sent in, for he has received about a dozen, but of these more than half were unavailable for use.

Questions as to the adequacy or quality of material, for instance, which are purely matters for the Laboratories, form the subject of numerous questions, and, of course, cannot be used. Then, again, occasionally questions are sent in which merely require reference to rule and section of the Code for a perfectly definite answer. Please send along a few which really involve some point of interest or difficulty, and *do it now.*

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Grounding An Autotransformer.

Question 326. If a 550/110-volt autotransformer is connected to the 550-volt, three-phase power system of a factory, should the secondary of the autotransformer be grounded?

Answer 1(D). Not if it is one of the parts of an isolated system.

Answer 2(R)*. In accordance with Rule 15*b* this secondary need not be grounded.

Answer 3(P)*. The Code permits but does not require this. (See Rule 15*b*.)

Answer 4(S)*. Rule 15 of the Code allows the grounding of secondaries where the voltage exceeds 150. I should not be in favor of grounding the secondary of a transformer of this type.

Answer 5(B)*. The secondary of an autotransformer, the primary of which is but 550 volts, does not necessarily need to be grounded.

Answer 6(F and G). The grounding of transformer secondaries where supplied from private industrial or lighting plants where the primary voltage does not exceed 550 volts is expected under Rule 15*b*.

Answer 7(E). We should not care to encourage the grounding of the secondary systems of autotransformers when the primary voltage exceeded 150 volts.

Answer 8(O). I should judge that in this case the secondary circuit of the autotransformer should not be grounded. It is not required under Rule 15*b*. Furthermore, if the secondary circuit of an autotransformer is grounded it also grounds the primary, and if several such transformers are on the same system it is probable that there will be differences of potential between the points grounded, and consequently a flow of current over the ground wire under normal conditions, which is contrary to the Code. A further reason is that the difference of potential between the ground and other parts of the 550-volt circuit is in excess of 550 volts.

Answer 9(T). Code Rule 15*b* would not require grounding, as primary voltage does not exceed 550 volts.

Answer 10(H)*. I should not allow it.

Answer 11(N)*. It certainly should not. An autotransformer has no distinct primary nor secondary; it is really a reactance coil and you tap off in shunt to a certain reactive drop a circuit which has its own constants. There is no definite suitable grounding point. Further, we are not told whether this is on a star or delta circuit, whether it itself is a three-phase appliance, or whether it is a single-phase coil across one leg of the three-phase system. All these matters would have to be considered, and, after all, it would be a very rare case where currents of dubious amount and doubtful origin would not be continually flowing over the ground wire, while the voltages from ground to the several lines might be higher than 550 in certain cases.

Fusing Service Mains.

Question 327. On a combined two-phase power and lighting system fed from one service, are we justified in fusing the service mains according to table B, Rule 18, the lighting circuits being properly protected where connected to the service buses?

Answer 1(D). No.

Answer 2(R)*. No. In service this condition could subject rubber-covered wire to a steady current flow of a higher rating than allowed in table A.

Answer 3(P)*. No. The fifth paragraph of Rule 8*c* applies only to the leads of a single motor.

Answer 4(S)*. No. See Rule 23*c* and Rule 8*c*. These are the only rules I know of that could apply, and these state it is for one motor only.

Answer 5(B)*. We should deem it proper to fuse the service mains according to table B.

Answer 6(F and G). Rubber-covered conductors are permitted to be fused in accordance with table B, when supplying current to one motor only, requiring large starting current, and should be fused according to table A, when other consuming devices of any kind are connected thereto.

Answer 7(O). Table B of the rule may be applied to rubber-covered wires only, in protecting the branch wires supplying current to only one alternating-current motor of the the type requiring large starting current. It may be used in connection with the service mains only when such mains feed nothing except one motor, as described above.

Answer 8(T). The rules do not permit the fusing of mains for induction motors in accordance with table B of Rule 18. If rubber-covered wire is used for such mains fuse protection must be according to table A.

Answer 9(H)*. No; raise the capacity of the mains.

Answer 10(N)*. There is a curious condition here. If this motor load consists of "only one motor of the type requiring large starting current" then the service mains may be so fused; if there are more than one, however, then they cannot be.

This is because the Code does not say the wires must carry "only the current for one motor" of this type, but "the current for only one motor" of this type, and nothing is said about any other load. This may seem like a quibble, but I have very excellent legal authority for it.

Of course the purpose was that the sole load on the wires allowed this special privilege should be one single alternating-current motor of this special type, and nothing else. But that is not the wording. In both Rule 8*c* and Rule 23*c* the wording should be changed to read: "Where the sole load on a rubber-covered conductor is one alternating-current motor of the type requiring large starting current, said conductor may be protected," etc.

Answer 11(E). I do not so interpret the rule. The wording of the fifth paragraph, Rule 8*c*, seems to be against such a liberty. "Where a rubber-covered conductor carries the current of only one alternating-current motor of a type requiring large starting current it may be protected by a fuse or an automatic circuit-breaker without time-limit device, rated in accordance with Table B of Rule 18." This privilege is limited to but one motor. The mains and the service should be protected in accordance with the requirements of table A, while the sub-mains which go to but one alternating-current motor may be protected under the provision of table B. This, I understand, to apply to each individual motor which may be fed from one set of mains, but through sub-mains; the mains being protected under table A, and the sub-mains may be protected under table B, when there is but one motor supplied by each set of the sub-mains.

Louisville Company Offers Free Electric Service to the Sick.

The Louisville Gas & Electric Company has announced that it will continue its offer again this year to provide free electric service to the indigent sick, provided the beneficiary is located on one of the distribution lines of the company. All that is required is for the attending physician to vouch for the applicant, after which the Louisville Gas & Electric Company will do the rest. Last year, in order to get the proposition fairly before the physicians of the city, letters stating the proposal were sent to 700 Louisville physicians. Electric toasters or electric fans, or both, are provided. Many requests for this service were received.

BOOK REVIEWS

"Mechanical Equipment of Federal Buildings Under the Control of the Treasury Department. By Nelson S. Thompson. Third revised edition. New York: Heating and Ventilating Magazine Company. Cloth, 402 pages (5¾x9 inches). Supplied by Electrical Review Publishing Company, Inc. for $3.00.

This volume, which covers heating, ventilation, plumbing, drainage and water supply, and even vacuum cleaners, as well as the electrical equipment, is primarily an effort at standardizing the equipment of postoffices and other federal buildings, with a view to real efficiency. However, much of the information compiled by the author is also valuable for those planning the equipment of other buildings, particularly in view of the systematic treatment and of the attention to innumerable details which count in practice. The electrical sections include estimates of the installed costs of conduits, wiring and fixtures of various types; recommendations for motors and controlling apparatus suited to various circuits and purposes; operating data for isolated plants; and a quite fair-minded discussion as to isolated plants versus central-station current. Obviously, a work of this kind cannot allow for such changes as are particularly noticeable from year to year in electrical practice and hence should only be authoritative for a limited time. Thus, the present (third) edition rules out both Gem and carbon lamps, but does not admit gas-filled lamps.

ALBERT SCHEIBLE.

"Essentials of Electrical Engineering." By John Fay Wilson. New York: D. Van Nostrand Company. Cloth, 345 pages (5¾x9 inches), 282 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $2.50.

Written by an instructor at the University of Michigan, this textbook is remarkable in its emphasizing the fact that continuous and alternating currents are governed by the same laws. Although recognizing electrical practice and illustrating the same both by cuts of standard apparatus and by diagrams of connections, Mr. Wilson's work is primarily for students familiar with trignometry and calculus. The general treatment is both clear and systematic, while the problems (of which there are nearly 350) should fix the underlying laws in the mind of the student. Appendices are devoted to developing the formulas for the calculation of inductance, hysteresis loss, capacitance, admittance, conductance and susceptance.

ALBERT SCHEIBLE.

"Alternating-Current Work." By W. Perren Maycock. New York: Whittaker & Company. Cloth, 415 pages (4¾x7¼ inches). illustrated. Supplied by Electrical Review Publishing Company, Inc., for $2.25.

Although signing himself as a consulting engineer, the author of this volume is evidently a born teacher, for every chapter displays his unusual aptitude at reinforcing clear explanations with simple analogies and lucid diagrams. Nearly 200 of the 260 cuts are devoted to diagrams and mechanical analogies which, coupled with a systematic treatment of the subject, make this book equally valuable as a textbook, and as a reference volume for those seeking an authoritative treatment of alternating-current practice in a form in which it can readily be grasped. As the title implies, the volume is intended for those interested in the practical utilization of alternating currents and hence covers both the underlying principles and their application in alternators, transformers, choking coils, meters and motors. Even electric ship propulsion and single-phase railways are included. The mechanical analogies are particularly apt and help to explain such phenomena as the effects of resistance, inductance and capacity in a circuit, both singly and in various combinations. At the same time, the mathematics used has been confined almost wholly to simple algebra and arithmetic.

ALBERT SCHEIBLE.

"The Principles of Dynamo Electric Machinery." By Benjamin F. Bailey. New York: McGraw-Hill Book Company, Incorporated. Cloth, 314 pages (6x9 inches), 222 illustrations. Supplied by the Electrical Review Publishing Company, Inc. for $3.00.

In evaluating physical quantities, the use of mathematics is necessary and indispensable, but before a mathematical analysis can be made the various elements of a physical phenomenon must be clearly apprehended. This book attempts to explain the actions and reactions in electrical machinery from the physical viewpoint and with a very limited use of mathematics. At best, however, there are some phenomena whose significance can be as readily exemplified by the aid of mathematics as in any other way. The author undoubtedly appreciates this, for on occasions he does not hesitate to use the calculus even without giving the necessary physical concepts upon which the equations are based.

In carrying out his plan, the author has divided the subject matter into 19 chapters under the following headings: General Principles, Electric Motors, General Principles of Dynamos and Motors, Systems of Distribution, Characteristics of Motors, Accessory Apparatus, Rating of Machines, Efficiencies and Losses, Direct-Current Measuring Instruments, Adjustable-Speed Motors, Alternating Currents, Inductance and Capacitance, Alternating-Current Measuring Instruments, Single-Phase and Polyphase Systems, The Transformer, Synchronous Generators and Motors, The Rotary Converter or Synchronous Converter, The Induction Motor, and The Single-Phase Commutator-Type Motor.

Most of the phenomena and principles are explained in clear and simple language, but there are a few places where the author has followed well established precedents of technical book writers. For example, on page 28 the author classifies electrical machines as dynamos and motors, using the term dynamo as synonymous with generator, and then on page 29 he says: "In all dynamos, whether used as generators or as motors, etc," which evidently makes the word dynamo a generic term. On page 18 we find the armature defined as the rotating member and on page 38 the stator is called the armature. Evidently the criterion is not rotation.

In defining a vector the author has followed the practice of some mathematicians and physicists when he says "a vector has magnitude, direction and sense." The reviewer is in a position to state that the highest authorities on vector analysis and quaternions such as Gibbs and Hamilton do not ascribe to a vector the property of sense. A careful analysis will show that sense and direction as used mean one and the same thing.

Likewise in his exposition of phase difference, the author has been unfortunate in his illustration. It requires considerable imagination to visualize Fig. 74 as two generators connected in series. For beginners the illustration does not illustrate.

The book is intended to satisfy the needs of those students who do not intend to follow electrical engineering as a profession, but it undoubtedly is well adapted for a first course in electrical engineering. The reviewer heartily approves the method of attack adopted by the author, and he believes that an understanding of electrical and magnetic phenomena as explained in the book will prove of great value in more advanced study of electrical engineering.

C. M. JANSKY.

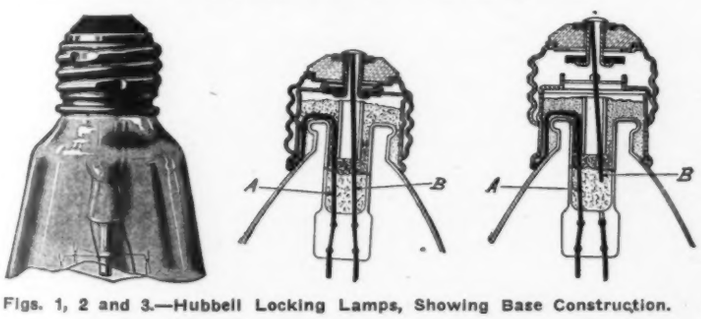
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Hubbell Locking Lamps.

The problem of insuring lamps against removal has always been a vexatious one. While this is a more important matter in large public buildings, such as hotels, railway stations, municipal structures, etc., it is also a matter of importance in shops and many other places. The difficulty connected with unauthorized lamp renewal is not only on account of theft of lamps, which frequently occurs, but on account of replacing lamps by other lamps of improper size or by heating devices which should not be connected to the lighting circuit.

Quite a number of locking sockets have been developed to overcome this difficulty and practically all of these depend on a key-locking means, which means the safety of the lamp is dependent upon the conscientiousness of the electrician who has made the installation or who is responsible for its maintenance, because, if the socket is left unlocked due to negligence or other cause, the lamp of course is not protected. To overcome the shortcomings of locking sockets, this matter has been solved by the development of a new type of lamp base. This base can now be obtained in standard-voltage lamps ranging from 105 to 125 and 220 to 250 volts and various sizes from 10 to 60 watts, it also can be provided for sign lamps ranging from 2.5 to 10 watts and from 10 to 125 volts.



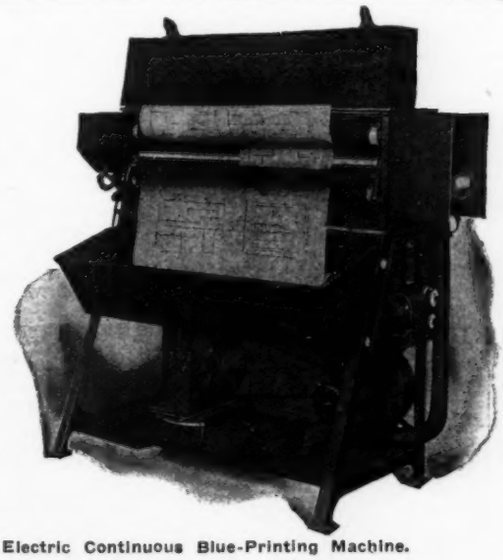
Figs. 1, 2 and 3.—Hubbell Locking Lamps, Showing Base Construction.

These locking lamps, which are being manufactured by Harvey Hubbell, Incorporated, Bridgeport, Conn., have a base consisting of two parts: the outer or rotating shell and the inner shell which is cemented to the lamp. The filament of the lamp is attached in the usual manner. As shown in Fig. 1, the lamp does not have any unusual appearance, but on studying the section shown in Fig. 2, it is seen that the two shells fit snugly within each other and both the leading-in wires *A* and *B* are soldered to the inner shell and to the center contact, respectively. Any lamp equipped with Hubbell locking base may be screwed into any standard Edison base socket, but cannot be removed from it by turning the lamp in the opposite direction because this merely revolves the inner shell without loosening the outer or screw shell. For removing a burned-out or broken lamp, it is necessary merely to give a slightly downward pull to the lamp bulb. This serves to rupture the leading-in wire *B*, which connects the center contact to the filament. As shown in Fig. 3, in the lowered position the outer shell of the base engages a reverse ratchet and this now permits the lamp to be unscrewed. It is evident any effort made to unscrew the lamp is unsuccessful and if it is attempted to forcibly pull the lamp out of the socket, the electrical connection in the base is permanently destroyed and the lamp made valueless.

From the foregoing it is seen that the Hubbell locking lamps afford a positive proof against removal. They are especially designed to permit ready insertion of a definite lamp into a socket, this to be left in service until it is to be replaced on account of burnout or breakage.

Electrically Operated Continuous Blue-Print Machine Using Cooper Hewitt Lamps.

The first Cooper Hewitt lamps used in electric blue printing were placed in front of a flat frame with reflectors behind the lamps, which allowed only prints as large as the frame to be made at one time. This limited the size of the tracing that could be accommodated, and made it necessary to reload the machine for each exposure. Lamps with flat frames are frequently satisfactory where the requirements are small, but where blue prints are large, the continuous machines are better.



Electric Continuous Blue-Printing Machine.

The Revolute Machine Company, 417 East 93rd Street, New York City, based the design of its Everett-McAdam type of blue-print machine upon a revolving glass cylinder, the light being within the cylinder and the rays striking practically perpendicular to the surface of the blue-print paper which is wrapped around the cylinder. By this scheme, 75 per cent of all the light is direct, 25 per cent reflected and none entirely lost. This makes the machine highly efficient and rapid and allows the production of a print of any length whatever.

The paper is laid over the revolving glass cylinder where it remains during three-quarters of a revolution, after which it leaves the cylinder and is caught in a suitable receptacle. The tracings are fed in between the paper and the cylinder so that the light strikes through the cylinder and the tracing on to the blue-print paper.

Continuous rolls of any length may be fed through the machine with either long tracings or those of smaller sizes, so that an extra standard roll of 50 yards may be printed in one piece.

Special high-power lamps, made for this particular service by the Cooper Hewitt Electric Company, Hoboken, N. J., allow the machine to print at a high speed on comparatively small current consumption. This speed efficiency is due partly to the design of the machine having the lights within the cylinder, and partly to the quality of the light from these mercury-vapor lamps, which is very well adapted to blue-print work.

Arc lamps may also be used on this sort of a machine. In the case of this type of lamp, which must be hung outside the cylinder, the light passes through the cylinder to the paper on the opposite side from the lamps, and the printing is done during half a revolution. Where mercury lamps are used inside the cylinder, the light passes through one thickness of glass, and the printing is done during three-quarters of a revolution. The mercury lamps are automatic and start by the turn of a switch, and, in contrast to arc lamps, require no attention whatever during their light, which is guaranteed to average 1,200 hours.

The machine, which is electrically driven, is equipped with a variable-speed gear that allows it to be run at a speed necessary to suit the requirements of different kinds of paper and different tracings or negatives to be printed. Due to the small curvature of the cylinder and a series of endless belts which hold the paper and tracing on the cylinder, a perfect contact is obtained at all points.

The revolving glass cylinder entirely eliminates the necessity of dragging the tracings and paper over a curved stationary glass, avoids the possibility of slipping, saves wear and tear on the tracings, and gives a sharp detail to the prints.

Electrically Operated Clock and Electric Sign.

An excellent example of effective electrical advertising has recently been completed for the Westchester Lighting Company, Mount Vernon, N. Y. On top of the office building of the company its name appears in large electrically lighted letters. At the corner are the words "Light, Heat, Power" in equally large letters. Above the latter sign is a 10-foot self-winding electric clock with dial, figures and hands outlined by electric lamps. Cluster posts and bright show windows also add to the effectiveness of the company's night display. Since the building faces the main line of the New York, New Haven & Hartford Railroad, which has several hundreds of trains passing by every day, the electrical display is exceptionally commanding of continued attention. The clock was furnished by the Betts & Betts Corporation, 256 West Thirty-fifth Street, New York. It was erected, as also the two signs, by the Federal Sign System (Electric), New York and Chicago.

Electric Clock and Sign for Central-Station Company.

Electrically Driven Eraser Cleaner.

The problem of removing chalk from blackboard erasers has for a long time been a troublesome one in schools and lecture halls. The ordinary method of pounding the erasers to remove the dust is not only very insanitary, but also hard on erasers. To overcome the disadvantages of this old method there has been placed on the market an electrically driven compact suction cleaner especially designed for removing the dust from the eraser. This it does in a very rapid, thorough and perfectly sanitary manner.

Electric Suction Type Eraser Cleaner.

The outfit is practically a small vacuum cleaning plant. The suction is produced by means of a one-twenty-fifth-horsepower universal motor that can be operated on either direct or alternating-current circuits. The outfit is neatly made up, with all of the metal parts well nickel-plated, and these are mounted on a hardwood cabinet with mahogany finish. This machine not only removes all of the chalk dust by means of strong suction, but it also includes a rotary bristle brush, which brushes the surface of the eraser being cleaned. Thus all of the chalk is removed without any of it escaping into the room. The chalk dust is drawn into the box and the exhaust air is filtered through a very fine muslin separator.

This outfit is being manufactured by the Wisconsin Electric Company, Racine, Wis.

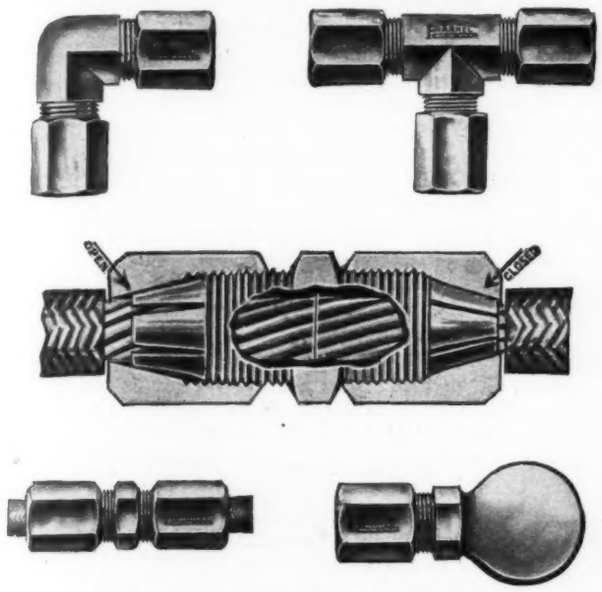
Frankel Solderless Connectors.

The electrical department of the Frankel Display Fixture Company has recently been incorporated under the title of the Frankel Connector Company, Incorporated, to carry on the manufacture of Frankel solderless connectors, Frankel test clips and other electrical specialties. The office and factory of the new company are located at 177-179 Hudson Street, New York City.

The illustration herewith shows several types of the Frankel connector. The phanton view in the center shows the principle of the connector and how the design has permitted the use of the fewest possible parts to make a rigid connection. This simple construction, it is claimed,

reduces the liability of the connector getting out of order and in addition provides a connection that is strong mechanically and electrically. The company is also manufacturing a line of connectors for panelboards to replace soldered terminal lugs for front and back connections.

By using Frankel solderless connectors in place of the soldered type of connection, the makers claim a substantial saving of time as well as the added advantage of providing a joint that can be broken down without harm to the cable.



Several Types of Frankel Solderless Connectors.

In the report containing the approval of the Frankel solderless connector, Underwriters' Laboratories, Incorporated, refers to a test made at 1,000 amperes in which the soldered joint being tested melted and the solder dropped from the joint, whereas the joints where the wires were attached to Frankel connectors were unaffected by the test.

Electric Water Sterilizer.

Water for drinking purposes should be pure; that is, it should be free from vegetable and animal impurities, since these constituents afford nourishment for the bacteria of typhoid or other diseases. It has been proven that these can be carried and propagated by water. Large apartment houses and hotels therefore find it profitable to maintain good systems for the purification of their water. Bottling plants that put up carbonated drinks spend much money in water purification, so that the pure fruit juices and extracts in their finished beverages may not be spoiled. Many large companies throughout the country are making money selling purified table water, and large up-to-date institutions, manufacturing plants and department stores are installing purification systems.

There are many methods of water purification. Some use filters, others chemicals, while still others treat the water by heat to remove the bacteria. Each of these methods will do the work required more or less perfectly, but there are objections to all such systems. It was due to these objections that the Electric Water Sterilizer Company, Scottdale, Pa., developed its standard No. 2 electric sterilizer.

It has long been known that electricity will decompose water into its elements—hydrogen and oxygen. It has also been discovered that at the time of the decomposition of the water, much of the animal and vegetable matter present in the water is rendered inert. The oxygen which is set free is in such a form that it will assist in destroying the lower forms of animal and vegetable life. At the same time it is made easier to filter the organic matter out of the water by mechanical filters.

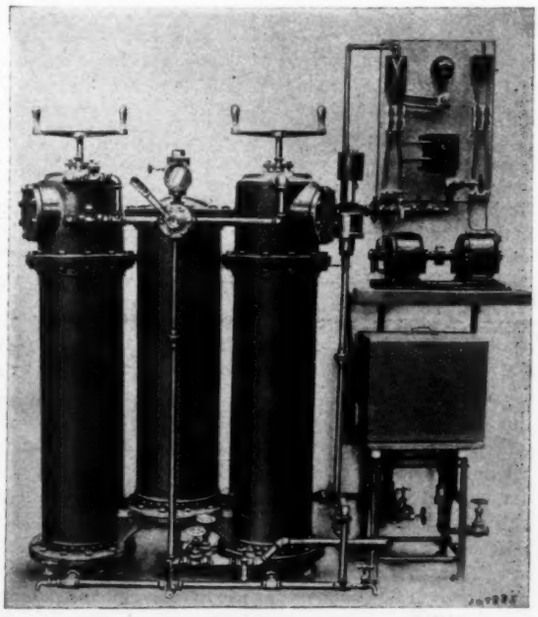
The sterilizer illustrated is composed of four essential parts, the electrode box, the coagulation chamber, the filter cylinders, and the automatic hydraulic motor and switch. The water to be purified first enters the electrode box, which is made up of a number of metal plates containing slots through which the water is passed.

After leaving the electrode box, the water flows into the coagulation chamber where the germs and bacteria are brought together. These are filtered out during the passage of the water through two filter cylinders. The water comes from the second cylinder ready for use.

Whenever water is drawn from any faucet connected with the machine, the hydraulic motor automatically closes the electric switch, so that power is being used only when the water is being drawn. When the water is turned off, the hydraulic motor stops and automatically breaks the electric circuit.

The electric circuit is insulated from the filter cylinder and water-supply line by long insulating tubes, inserted in the metal piping under the electrode box, and the electrode box itself rests on four heavy porcelain knobs, thus preventing any grounding of the circuit.

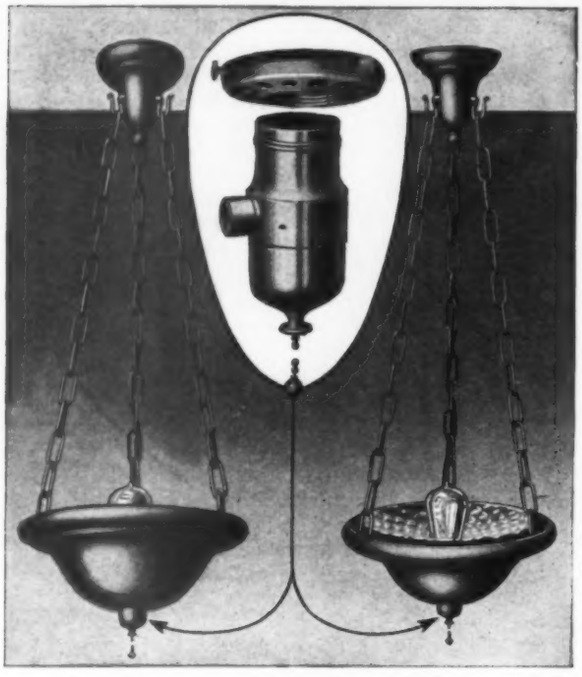
In installations where alternating current is the only available source of power, a means of changing this to direct current is advisable, as in the latter form the current consumption is less. The illustration shows an electric water sterilizer equipped with a Westinghouse motor-generator set and control panel. This set is used to change the alternating current of the supply system to direct current for use in treating the water. It is connected to an automatic switch controlled by the flow of water, so that it is in operation only while water is being drawn.



Electric Water Sterilizer with Motor-Generator.

New Bryant Socket for Indirect Lighting Fixtures.

The advantages of indirect lighting are quite generally conceded and this method of illumination has become so desirable that many fixtures of other and older types are being discarded. It often happens, however, that the wiring as originally done



New Bryant Socket and Application to Indirect Fixtures.

has not provided for wall switches and heretofore most indirect fixtures did not permit of pull socket or button switches. In this connection an interesting innovation is the new Bryant socket illustrated herewith.

As will be noted from the illustration, this pull socket with bottom chain guide fits snugly into the bottom of the bowl and protrudes through it just enough to enhance the artistic effect. The socket has the threaded bead upon which any diameter of Uno shade-holder can be readily mounted. The bottom chain guide with pull chain hanging only the necessary length below the fixture provides a most convenient form of local control and at the same time does not mar the general artistic effect of the design of the fixture.

This same style of socket can also be used on a side-wall fixture by attaching it directly to a brass nipple extending from the outlet—the length of this nipple being governed entirely by the dimensions of the canopy and shade-holder used.

Pole-Top Gin for Line Construction.

A pole-top gin has been especially designed to meet certain demands in the erection of steel cross-arms now used so generally on wood-pole transmission lines. The original application was limited to this small field of construction, but it has since been found that it can be used on all line work where weights of any kind must be lifted and supported on wood poles, and it is meeting with considerable favor from linemen in all kinds of work.

It has been found useful in handling transformers on poles, either in new installations or in replacements. As an aid in general maintenance work, it means a saving of hours of labor and time which result simultaneously in the saving of considerable money. In trouble work, especially where time is such an important factor, it can effect such a shortening of an outage in the case where transformers break down and have to be replaced, as to warrant its purchase for use in only one such trouble case. It can also be very satisfactorily used in replacement of poles, as it obviates the necessity of a special pole hoist and a gang of pole erectors.

This pole gin, pictured in the accompanying illustration, has recently been placed on the market by the Railway & Industrial Engineering Company, Pittsburgh, Pa., and at this time a description of its various features and its operation may be desirable.,

It will be noted that it consists of a main base fitted with four spurs and a chain and lever for clamping it to the pole. Tackle can be suspended from the arms at the top. To attach the pole gin the lineman jabs the lower spurs into the pole as he would a spear, then the top of the channel is thrust towards the pole, and the upper supports sink into the wood. In this position the gin will "stay put" while the handle is opened and the chain carried around the pole and linked into the catch. The handle is then closed, causing the chain to bite into the pole. In its closed position, the handle is self-locked. If the chain is too loose and does not bite into the pole firmly enough, the handle is opened, the chain disengaged from the catch and lengthened out one link, and pushed up at the back of the pole. This virtually acts so as to shorten the chain when the handle is closed again. The chain takes a firm hold and the gin is ready for use.

As the load is placed on it the lower spurs bite into the pole further and become firmly placed. This is an especially attractive feature, that is due to the simplicity and ease of attachment to and detachment from the pole regardless of the load to be carried, the gin is readily attached, and there is no danger of its slipping loose. When the work is finished it can be readily and instantly detached, although it may have carried its maximum load.

As designed, the present gin can safely carry a load of 1,500 pounds and if necessary 2,000 pounds in emergency. This capacity is ample, therefore, to handle the usual loads that are placed on the pole.

In various other classes of work where it is customary to lash a rope to the top of the pole for hoisting purposes, this gin can be used to advantage and economically. In its original application where a new transmission line was being built the groundman was able to hoist the steel crossarms from the ground into position at the very top of the pole, while the lineman without the usual strenuous effort on his part bolted the arm into place.

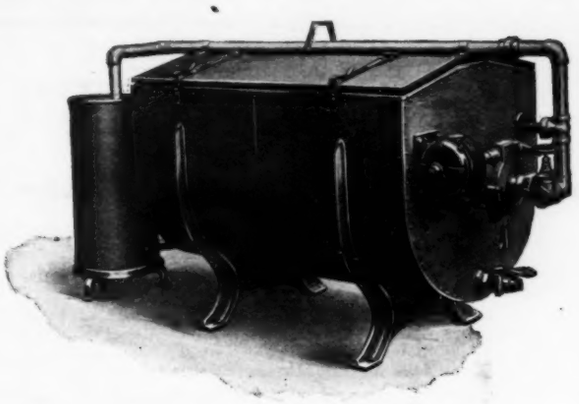
In all line work, the new gin will relieve the lineman of heavy lifting and give the groundman more work. This results, therefore, in a greater efficiency of the line gang.

Application of Pole-Top Gin.

Motor Application to Pasteurizer.

The main object of pasteurization of milk is to eliminate diseases by destroying pathogenic bacteria or disease-producing germs. Milk from healthy cows, if properly handled, is free from disease germs, but exposure to air and unhealthy conditions causes such germs to accumulate and propagate in vast numbers. This tendency can be overcome by pasteurization. Physicians and scientific men claim that the use of pasteurized milk has saved the lives of a multitude of children as well as of adults, and they consider it health-giving to a very decided extent, as the process of pasteurization does not detract from the nutritive value of milk.

The widespread demand for pasteurized milk and cream has led to the development, by the A. H. Reid Creamery & Dairy Supply Company, of Philadelphia, Pa., of a line of pasteurizers using what is known as the Batch pasteurizing system. The machine consists essentially of a cylindrical vat and a spiral coil of heavy copper tubing. The coil is arranged so that it can be revolved, the ends terminating in a gland type of stuffing boxes. The water is heated in a separate tank connected to either end of the coil by piping. The water is circulated from the heater through the coil and back to the heater. The practice is to heat the milk to 140 or 145 degrees Fahrenheit and hold this temperature for 30 minutes. Then cold water is introduced into the coil and the milk cooled down to bottling temperature, which is about 50 degrees Fahrenheit or less.



Electrically Driven Pasteurizer.

The illustration shows a Reid positive pasteurizer equipped with a three-quarter-horsepower single-phase Westinghouse induction motor. The motor is direct-connected to the worm drive of the spiral coil and gives the constant speed necessary for pasteurization work.

View in One of the Factory Departments of the Metropolitan Engineering Company.

The rapid growth of the central-station industry has created a large field for electrical protective devices and specialties of various kinds, to the manufacture of which the Metropolitan Engineering Company, of New York City, has devoted itself for many years. The factory buildings of this company are located at 1238-1262 Atlantic Avenue, Brooklyn. They are large and commodious structures comprising several acres of well lighted floor space. These buildings have been constructed in accordance with the most advanced ideas of efficiency engineering and they afford special facilities for the rapid handling of large orders. From the time that material enters into the plant in its raw state until it leaves as a finished product, it does not cross its own track and moves through the various manufacturing departments on the regular scale. The view shown above is along one side of the third floor of building No. 2, where various cutout blocks, fuses, etc., are being assembled. The line of Metropolitan protective devices and specialties developed and manufactured by the company consists in part of the following: Service and watt-hour meter protective devices, alternating-current network protectors, reactance coils, subway cable racks, primary cutouts and fuses, service switches, panelboards and switchboards, direct-current cable-testing ammeters, electric bath cabinets, fixtures for type C Mazda lamps, cinder and dust catchers, electric dishwashers, electric refrigerators, watt-hour meter seals, copper terminals and sleeves, sealable fuses, etc.

INDUSTRY ACTIVITIES

Harry W. Terry announces the removal of his engineering offices on June 1 to 486 Endicott Building, New York City.

The Hartman Electrical Manufacturing Company, Mansfield, O., has issued Bulletin No. 15, on its line of lighting and ignition switches for automobiles.

C & C Electric & Manufacturing Company, manufacturers of motors, generators and appliances, Garwood, N. J., has issued Bulletin No. 101, on its type-SL motors.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Leaflet No. 3862, on its type C1, two-speed, alternating-current, elevator motors.

Globe Stove & Range Company, Kokomo, Ind., has issued a leaflet giving directions for using Globe electric ranges. Copies will be sent to those interested upon request to the company.

The Van Dorn & Dutton Company, Cleveland, O., manufacturer of gears, announces the removal of its office in Denver, Colo., from the Ideal Building to 1633 Tremont Street, C. H. Davidson remaining as its district sales manager.

Stanley & Patterson, 23 Murray Street, New York City, have issued a mailing card announcing the opening of their new warehouse at West and Hubert Streets, New York City, where they will maintain a large stock of electrical supplies.

Mesher Ornamental Post Company, Evansville, Ind., through its Chicago district office, of which A. M. Ryckoff is manager, has received the contract for furnishing 340 ornamental standards, which will be a part of a white-way system to be installed in Springfield, O.

Western Conduit Company, Youngstown, O., announces the removal of its offices in Philadelphia, Pa., to the Pennsylvania Building. The Youngstown Sheet & Tube Company, of which the former company is a subsidiary, has also removed its Philadelphia offices to that building.

Fairbanks, Morse & Company.—At an annual meeting of the board of directors of Fairbanks, Morse & Company the following officers were elected for the coming year: Chairman of the board, C. H. Morse, Sr.; president, C. H. Morse, Jr.; first vice-president, W. E. Miller; vice-president, H. C. McClary; vice-president, H. J. Fuller; secretary and treasurer, F. M. Boughey; assistant treasurer, B. E. Cremerius, and assistant secretary, C. A. Meyer.

Arthur D. Little, Incorporated, 93 Broad Street, Boston, Mass., the well known firm of chemists, engineers and industrial plant managers, has organized its Canadian business as a separate corporation to which a charter has been recently granted. It is known as **Arthur D. Little, Limited,** with headquarters at 137 McGill Street, Montreal, Canada. The new corporation has been organized and equipped for the service of Canadian industry and the study and development of Canadian resources.

Louisville Signs Must Be Kept Burning.—Judge Samuel Boldrick in the Ordinance Court, Louisville, Ky., has upheld the validity of an ordinance which stipulates that those who install electric signs in front of their places of business over the sidewalk must keep them burning on both sides from dusk until 10 p. m. The case, which involved ten defendants, hung on this point, the city contending that since it issued the permit it had a right to stipulate conditions, while for the defendants it was contended that in this matter the city was attempting to regulate a matter of esthetics rather than exercising a police power.

Lake Superior Electrical Company, Superior, Wis., is preparing to erect a two-story office and factory building, 55 by 100 feet, at North Third Street and Grand Avenue, in that city. The company will be prepared to enter into the manufacture of electrical specialties and appliances on a larger scale than allowed by present facilities.

Dayton Engineering Laboratories Company.—It has been practically decided that the Dayton Engineering Laboratories Company, of Dayton, O., manufacturer of "Delco" electric automobile starting and lighting equipment, will be one of the companies involved in the proposed merger of motor-appliance manufacturers to form the United Motors Corporation. President Edward A. Deeds is said to have made this announcement recently. The several companies involved will remain intact for the purpose of operation, it is understood.

Ward Leonard Electric Company, manufacturer of electric controlling devices, announces the removal of its main office and factory from Bronxville, N. Y., to its new building at Mt. Vernon, N. Y. The increased demand for floor space and labor operators is the reason for the change. The company began manufacturing electric controlling devices in Bridgeport, Conn., in 1892. After two years in Bridgeport and three years in Hoboken, N. J., it moved to Bronxville, where it has been located for the past 19 years. The new factory is somewhat nearer to New York City than the old one.

Anderson Electric Car Company's New Service Station.—A marked evidence of the rapidly growing popularity and the prosperity of the Anderson Electric Car Company is soon to appear in the form of a splendid new service, repair and sales station, to be erected at the corner of Cass Avenue and Antoinette Street, Detroit, Mich. The new building will be four stories in height, and will have a floor space of about 60,000 square feet. Every convenience will be installed for efficiently and quickly handling all kinds of electric car and battery repair or adjustment work. A special feature of the service department will be the enlargement and perfection of a monthly inspection and adjustment service, for which a very nominal sum will be charged the car owner. This service will be so comprehensive and thorough that it will keep the average car in perfect running condition, thereby eleminating expensive repairs that are often the eventual result of improper care or neglect. All makes of electric cars will be welcome at the new station. A special department for automobile painting will be installed, which will be representative of the highest standards of the coach-painting art. It seems that this new Detroit electric car station will be the largest and finest establishment of its kind in the United States, and may be properly termed a fitting monument to the progress, energy and foresight of the Anderson Electric Car Company, which for the past ten years has constantly striven to place the electric car in the strong position of approval it is now enjoying. At the present time there are over 800 Detroit Electrics used in and about Detroit. More than a year ago it became apparent that the present service station of the Anderson Company, at 687 Woodward Avenue would soon become inadequate to care for Detroit Electric cars, considering the volume already in use and the rapid rate of increase, as evidenced by daily sales. The larger and more efficient facilities of the new station, the site of which was very carefully selected, therefore, appear to be merely the logical necessity created by a prosperous, well managed industry.

PERSONAL AND BIOGRAPHICAL

MR. O. S. TAPPEN has recently been placed in charge of the Chicago office of the Bristol Company as district manager. Mr. Tappen has been connected with the Bristol Company for a number of years, at both the home office in Waterbury, Conn., and more recently at the Pittsburgh office, besides having spent some time in a temporary capacity at the Chicago office.

MR. J. M. DRABELLE, recently elected president of the Iowa Section of the National Electric Light Association, is electrical engineer for Iowa Railway & Light Company, Cedar Rapids, Iowa. He received his early education in the public schools of Umatilla, Fla., Des Moines, Iowa, and Trenton, Mo. His high-school education was received in Blees Military Academy, Macon, Mo., and West Des Moines, and he was graduated from the college of engineering, Purdue University, in 1910, receiving the degree of electrical engineer in 1915. Since his graduation Mr. Drabelle has been connected with the Cedar Rapids and Iowa City Railway & Light Company, the Boone Electric Company, the Iowa Electric Company, the Iowa Falls Electric Company and with the Iowa Railway & Light Company.

J. M. Drabelle.

MR. W. H. THOMSON, JR., who on June 1 became general manager of the Kansas City (Mo.) Light & Power Company, was graduated from Cornell University in 1898. His first executive position was that of president and general manager of the Corsicana (Tex.) Traction & Light Company. After leaving there he was employed either as manager or assistant manager of the central-station companies at St. Paul, Minn.; Fargo, N. D., and San Antonio, Tex. In 1911 Mr. Thomson was chief operating engineer of the Illinois Traction System, with headquarters at Peoria, and the following year he became general manager of the Des Moines (Iowa) Electric Company, which position he held until the recent change. His successor at Des Moines is MR. M. G. LINN, who was general superintendent of the Bloomington & Normal Railway & Light Company, Bloomington, Ill., for 15 years.

MR. LOUIS E. GOULD, of Presque Isle, Me., has been appointed manager of the Caribou Water, Light & Power Company.

MR. HENRY I. HARRIMAN, of the New England Power Company, has been elected first vice-president of the Boston Chamber of Commerce.

MR. R. M. HENDERSON, district manager of Stone & Webster Engineering Corporation, with offices at Chicago, Ill., has been elected president of the Alumni Association of Armour Institute of Technology.

MR. OTTO F. LUEPKE, until recently superintendent of the municipal electric-light and water plant at Randolph, Wis., has assumed a similar position in the municipal plant at Reedsburg, Wis. Mr. Luepke has been engaged in municipal electric-light plant work in Wisconsin for some years past.

MR. THOMAS H. BIBBER has resigned as general sales manager of the Adams-Bagnall Electric Company, Cleveland, O., and takes up immediately new duties as sales manager of the Luminous Unit Company, St. Louis, Mo. "Tom," for a long time sales manager for Edwards & Company, New York, N. Y., has struck a fast gait recently. His work with Adams-Bagnall was highly successful. His new connection is to his advantage, and the company adds a virile and enthusiastic element in calling him to its organization.

MR. CHARLES D. LE MAISTRE, of London, England, was among those who attended the Chicago conference on safety rules held by the Bureau of Standards this week. Mr. Le Maistre is secretary of the Electrical Section of the British Engineering Standards Committee, the authority which passes upon all standard engineering specifications in England. He is in this country to represent the British members of the International Electrotechnical Commission in conference with the American members. One meeting has been held in New York and another is to follow. Meanwhile Mr. Le Maistre will visit Canada and various parts of this country.

MR. J. E. ERICKSON has joined the sales organization of the Packard Electric Company of Warren, O., and will cover the territory formerly in charge of MR. BENJAMIN SMITH. Mr. Erickson's experience in the electrical field dates back to 1903 when he entered the employ of the Edison Electric Illuminating Company, of Boston, spending about a year with that concern. He then entered the engineering department of the Condit Electrical Manufacturing Company, of Boston, covering its New England territory, after which he was transferred to Chicago, Ill. Two years later he took charge of the Cleveland office of the Condit Electrical Manufacturing Company, resigning in 1914 to enter the Cleveland office of the Western Electric Company. Mr. Erickson had specialized on motor-car power plants and central-station practice, which experience peculiarly adapts him for the duties associated with his new position.

MR. W. W. STOREY has been appointed commercial agent for the Puget Sound Traction, Light & Power Company at Puyallup, Wash., to succeed MR. W. P. ELLINGWOOD, who recently met death in an automobile accident. Mr. Storey is at present commercial agent at Kent, and for a short time he will have charge of both the Kent and Puyallup stations.

MR. F. B. GLEASON, who recently became general telephone sales manager for the Western Electric Company, was formerly manager of the Western Electric Company in the Far East, with offices in Tokio, Japan. Mr. Gleason was born in Red Oak, Iowa, and was graduated from the University of Iowa in 1901. He has been identified with telephone interests since 1902, when he acted as special agent for the Iowa Telephone Company. In 1904 he became associated with the telephone department of the Western Electric Company at Chicago and in 1907 he opened that company's branch house in Dallas, Tex. In 1909 Mr. Gleason was appointed manager of the company's Pacific district, the position he held until 1912 when he was transferred to Tokio.

F. B. Gleason.

MR. BYRON T. GIFFORD, chief engineer of American Public Utilities Company, has been elected president of the National District Steam Heating Association. The association is composed of some 500 companies operating central steam and hot water heating systems.

OBITUARY.

MR. CHARLES M. EVELETH, an electrical engineer for many years employed by the New York Telephone Company, died May 24 at his home in Bayside, L. I., in his forty-fifth year.

MR. WILLIAM P. HARPER, head of the purchasing department of Allis-Chalmers Manufacturing Company, died suddenly in Milwaukee on May 27. He was connected with the company for fifteen years, was president of the Northwestern Manufacturing Company, of Milwaukee, and vice-president of the First National Bank of West Allis, Wis. A widow and son survive.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

AUGUSTA, ME.—The Central Maine Power Company has applied to the Public Utilities Commission for authority to purchase the capital stock of the Newport Light & Power Company.

BELLOWS FALLS, VT.—Plans are being considered by the City Council for the establishment of a municipal electric-lighting plant.

ENOSBURG FALLS, VT.—Plans are being considered here to erect a new electric-lighting plant to cost $10,000.

BOSTON, MASS.—The Edison Electric Illuminating Company has started construction of a large substation for the distribution of energy in the Milton district.

HOLYOKE, MASS.—The electric light department proposes to erect a coal pocket in connection with the generating station.

LYNN, MASS.—The Campbell Electric Company will erect a six-story addition to its factory here.

SHELBURNE FALLS, MASS.—The New England Power Company of this city has purchased the holdings of the Connecticut River Transmission Company, of Worcester, Mass.

PROVIDENCE, R. I.—The Rhode Island Company, which operates extensive street railways, is to build and equip two new transformer stations at Harmony and Burrillville, costing about $45,000.

MANCHESTER, CONN.—A contract for the construction of an electric railway to connect this place with Willimantic, via Coventry, a distance of about 20 miles, has been awarded. The undertaking involves about $1,000,000.

NEW HAVEN, CONN.—The Connecticut Company has awarded a contract to The J. G. White Engineering Corporation, of New York City, for the engineering and construction of a new steam power plant in this city. The plans for this power station are being prepared for an ultimate capacity of 100,000 kilowatts. Construction work on the foundation for this plant will begin this week. This plant will take the place of the company's old direct-current station at New Haven, and probably two substations will be built for local distribution of energy to the Connecticut Company's lines. The energy generated by this new plant will be in addition to that delivered to the Connecticut Company's lines by its other important stations, among which are those located at Waterbury, Bridgeport, Hartford and Berlin, Conn.

BROOKLYN, N. Y.—Plans have been prepared for a power plant to be erected by Ralph Leininger in Grand Avenue near Flushing Avenue. Helmle & Corbett are the architects.

BROOKLYN, N. Y.—The Brooklyn Edison Company has purchased property at Willoughby and Pearl Streets for an addition to its plant, to be erected at a cost of about $1,000,000.

BUFFALO, N. Y.—The Seneca Street Business Men's Association has petitioned the City Council for the installation of a modern electric-lighting system in Seneca Street.

EARLVILLE, N. Y.—Extensions to its distribution lines are being considered by the Earlville Electric Light Company.

FAIR HAVEN, N. Y.—Plans for an installation of an electric-lighting system are being considered here.

GLOVERSVILLE, N. Y.—The installation of a white-way system in the business district is being considered by the City Council.

LYSANDER, N. Y.—The Public Service Commission has approved the exercise of franchises in this city for the construction of transmission and distribution lines by the Seneca River Power Company, of Baldwinsville.

ASHVILLE, PA.—The Penn Central Light & Power Company, of Altoona, is preparing to furnish this city with electrical energy for street lighting and private consumption.

ERIE, PA.—The Erie Lighting Company has filed an application with the Public Service Commission asking permission to issue $350,000 in stock. According to the application the proposed issue will be used to retire present outstanding six-per-cent preferred stock, to provide funds for reimbursing the company's treasury, for expenditures made from earnings, for improvements, extensions and betterments to its plant during the last three years and to provide funds for the completion of an addition to the company's plant.

MARCUS HOOK, PA.—The American Viscose Company has awarded a contract to William Provost, of Chester, for the construction of a new electric power plant.

POTTSVILLE, PA.—The Eastern Pennsylvania Light, Heat & Power Company has been incorporated with a capital of $5,000 by E. G. Walborn to furnish electric service in Rahn Township.

TARBORO, N. C.—Bonds in the sum of $30,000 have been issued for extensions and improvements to the electric-lighting and waterworks systems.

SUMMERTON, S. C.—Bonds in the sum of $6,000 have been voted to complete the electric-lighting plant here. D. O. Rhame, secretary of Commissioners of Public Works, has prepared plans.

BLUE RIDGE, GA.—An electric railway will be constructed between this city and Copper Hill, Tenn., a distance of about 14 miles. H. P. Mulkey, of Blue Ridge, is interested in the project.

ROME, GA.—An ordinance providing for a special tax for the purpose of erecting a municipal electric-lighting plant is being considered by the City Council.

ROYSTON, GA.—Arrangements are being made for the development of a water-power site on Broad River at a point about eight miles from this city. Bonds in the sum of $300,000 will be issued, the proceeds to be used for the development. The J. B. McCrary Company, engineer, Third National Bank Building, Atlanta, Ga., is preparing plans.

TAMPA, FLA.—The Tampa & Eastern Traction Company has awarded a conditional contract to the Utilities Construction Company, of Norristown, Pa., for the construction of an electric railway from Tampa to Lakeland, Fla., a distance of 33 miles.

NORTH CENTRAL STATES.

EDGERTON, O.—E. A. Geauque has been granted permission by the Public Utilities Commission to sell his electric-lighting plant and distribution system to the Northwestern Ohio Light Company, of Van Wert.

COLLEGE CORNER, O.—J. H. McCray has been granted a franchise to erect and operate an electric-lighting plant in this city. It is proposed to have the plant in operation within a few months.

YOUNGSTOWN, O.—The council is considering installation of a white-way system on Front, Champion, Felps and Wood Streets.

GALVESTON, IND.—The Indiana Railways & Light Company, of Kokomo, has petitioned the Public Service Commission for permission to purchase the holdings of the Galveston Light & Power Company. If permission is granted, energy for the local system will be secured from the former company's station at Kokomo.

TOPEKA, IND.—The Hawks Electric Company, of Goshen, is negotiating for the purchase of the local electric-lighting system.

ARENZVILLE, ILL.—An electric-lighting plant will be installed here by J. G. Pratt and others of this city.

GREENFIELD, ILL.—The Central Illinois Public Service Company is planning to build a new service station in this city, to be equipped with new machinery.

EAST ST. LOUIS, ILL.—The Rapid Transit Company of Illinois has disposed of $3,500,000 worth of bonds for the purpose of constructing an electric railway from East St. Louis to Chester. The company has practically concluded negotiations for the purchase of the Wabash, Chester & Western Railroad, a steam road which operates between Chester and Mt. Vernon, Ill., and which will be electrified. D. P. Roberts is manager of the Rapid Transit Company.

CALUMET, MICH.—Plans for an ornamental lighting system for this city have been proposed by the Houghton County Electric Light Company and probably will be adopted by the city.

HESPERIA, MICH.—Reed & Speese, of Whitehall, Mich., are endeavoring to obtain a franchise for the operation of a hydroelectric plant on White River, to furnish energy for light and power to this city.

LACROSSE, WIS.—The power plant of the Wisconsin-Minnesota Light & Power Company was destroyed by a fire last week, started by lightning. The loss is estimated at $75,000, fully covered by insurance, and the plant probably will be rebuilt at once.

OREGON, WIS.—An election will be held this week to vote on the question of establishing an electric-lighting plant here.

OSHKOSH, WIS.—Tentative plans for a new lighting system for this city have been prepared by W. A. Baehr, consulting engineer, of Chicago, and are being considered by the City Council.

SHAWANO, WIS.—The city is considering plans to construct a hydroelectric plant on Wolf River near here at the cost of about $70,000.

TWO RIVERS, WIS.—The Wisconsin Public Service Company has been granted a franchise to extend its lines to this city to furnish service here. Clement C. Smith, 1410 First National Bank Building, Milwaukee, Wis., is president of the company.

WASHBURN, WIS.—The Commercial Club has appointed a committee, of which F. T. Beers is a member, to obtain estimates on the cost of an ornamental street-lighting system for the business district.

ADA, MINN.—Plans are being considered for the installation of a white-way system in the business district.

ALEXANDRIA, MINN.—J. F. Druar, 312 Commercial Building, St. Paul, Minn., is preparing plans for improvements required at the municipal electric-lighting plant here.

BACKUS, MINN.—Arvig Brothers have been granted a franchise to erect and operate an electric-lighting plant here.

HARTLAND, MINN.—Plans are being discussed here for the establishment of a white-way system by J. A. Halverson and others. The electric-lighting plant being erected here will be completed by fall.

AURORA, IOWA.—The Smith Power & Light Company, of Arlington, Iowa, has been granted a franchise for installing an electric-lighting system here.

DERBY, IOWA.—A franchise to install and operate an electric-lighting system here probably will be granted to the Leon (Iowa) Electric Company.

FAIRFIELD, IOWA.—The Home Gas, Light & Power Company has been incorporated here with a capital of $10,000 by Vernon L. Hague and others. The company will manufacture and distribute electricity and gas for light, heat and power.

LYONS, IOWA.—The Commercial Club is advocating the installation of a boulevard lighting system in the business district here.

BRECKENRIDGE, MO.—The city has entered into a contract with the Hamilton Electric Light Company, of Hamilton, Mo., whereby the latter will furnish electrical energy for street lighting and private consumption.

BURLINGTON JUNCTION, MO.—The City Council is considering a proposition from the Maryville (Mo.) Electric Light & Power Company for the purchase of the municipal electric-lighting plant. If the sale is made the company will erect a transmission line from Maryville to this city to supply energy.

BLUE HILL, NEB.—The City Council has selected plans submitted by R. A. Bradley & Company, of Hastings, for the new $7,000 municipal electric-lighting and water plant to be erected here during the summer.

HOLBROOK, NEB.—Bonds have been voted for the erection of municipal electric-lighting plant.

PILGER, NEB.—E. G. Brueggeman, of Norfolk, has been granted a franchise to erect and operate an electric-lighting plant here.

SIOUX FALLS, S. D.—A general resolution requiring all telegraph, telephone and electric distribution wires to be placed underground in certain sections of the city has been passed.

YANKTON, S. D.—Plans are being considered for a number of extensions to the street-lighting system here.

PETERSBURG, N. D.—The Petersburg Electric Company has been organized by A. R. Swendseid and others. The company will erect a power plant here in the very near future.

WASHBURN, N. D.—An addition is being built to the electric-lighting plant here to house the new generating equipment to be installed soon.

SOUTH CENTRAL STATES.

PADUCAH, KY.—For the purpose of establishing a white way on Broadway, the Retail Merchants Association has asked the city to borrow $30,000. Extensions to the municipal electric-lighting plant will be made if the plan is accepted.

WHITESBURG, KY.—The Commercial Club of this city is considering a plan looking toward establishment of an electric-lighting plant to serve the community.

LAFAYETTE, TENN.—The Clarksville (Tenn.) Ice & Coal Company has purchased the lighting and ice plant of the A. C. Burnett Company and will dismantle it.

ONEIDA, TENN.—The Skaggs-Reagan Electric Company, of Helena, Tenn., is installing a city lighting plant here. The same company has recently completed an installation at Jamestown, Tenn., and will put in a plant at Crossville.

KINGSPORT, TENN.—The Kingsport Power Company has been chartered by Edwin G. Woodling and others to furnish electric service here.

ROCKWOOD, TENN.—Present indications are that this city and Kingston will be supplied with electrical energy from the Ocoee power plant of the Public Light & Power Company. A transmission line will be built from Lenoir City and when it is ready for service the local plant probably will be dismantled and sold.

ATMORE, ALA.—A company is being organized by W. D. Owens, J. E. McCoy and others to develop a waterpower site on the Perdido River near here.

GADSDEN, ALA.—The City Council has amended the franchise to Alabama Power Company, giving the company an additional year in which to furnish the city with energy for electric light and power. The new light and power franchise will be for a period of 30 years.

COLUMBUS, MISS.—The holdings of the Columbus Light & Power Company, the stock of which for a number of years have been owned by an eastern corporation, have been purchased by Memphis capitalists, R. B. Fant has been elected president and R. B. Claggett and E. J. Lenz, both of Greenville, members of the board of directors.

CLIO, ARK.—The question of issuing bonds for the establishment of an electric-lighting system will be submitted to vote.

OKMULGEE, OKLA.—The Okmulgee Light & Ice Company is making the installation of a white-way system for this city and is making a number of plant changes and improvements.

SAPULPA, OKLA.—The Pioneer Telephone & Telegraph Company will erect a three-story building to cost about $60,000. Modern equipment will be installed.

VICI, OKLA.—The City Council is planning to call an election for the purpose of submitting to the voters a proposition to issue $25,000 in bonds for the erection of municipal electric-lighting and waterworks systems.

DATES AHEAD.

Electrical Supply Jobbers' Association. Annual summer meeting, Hot Springs, Va., June 6-8. Secretary Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

Ontario Electrical Dealers' and Contractors' Association. Annual convention, Toronto, June 6-8. Secretary, Marshall Soules, Oshawa.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Cleveland, O., June 22-23. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer *Rochester*, June 20-24. Secretary, Herbert Silvester, Rochester, Mich.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

CORPUS CHRISTI, TEX.—The Ward Island Interurban Company will soon begin the construction of an interurban electric railway from Corpus Christi to Ward Island, a distance of 10 miles. Ormsby McHarg, of New York City, is president.

DALLAS, TEX.—The Texas Southern Traction Company and the Texas Traction Company have been merged into a new company, called the Texas Electric Company. The consolidated company owns and operates 251 miles of interurban electric railway in North and Central Texas. It plans to extend the Dallas-Waco line from the latter city to Austin, a distance of 100 miles.

SANGER, TEX.—The Sanger Light & Power Company has been incorporated with a capital of $10,000 by C. P. Dodson and others to erect and operate an electric-lighting plant here.

WESTERN STATES.

CARLSBAD, N. M.—M. Tansill, owner of the Tansill power site, has applied for a franchise to supply energy for electric lighting in this city.

TUCSON, ARIZ.—Contracts for various supplies for the power plant to be erected at the University have been awarded.

LOVELOCK, NEV.—The Nevada Valleys Power Company has been awarded a contract by the County Commissioners to place lights at various points in the business and residential districts of the town of Lovelock.

ASHTON, IDAHO—The Ashton & St. Anthony Power Company has applied for a franchise to furnish electrical energy for heating purposes here.

ANACORTES, WASH.—The Anacortes Light & Water Company, in filing supplemental articles of incorporation, has changed its name to the Washington Power, Light & Water Company. It is reported that additions and extensions to the local plant and lines will be made, and that financial arrangements are practically completed.

MABTON, WASH.—The Pacific Power & Light Company has applied for a 50-year franchise in this city.

PASCO, WASH.—The Pacific Power & Light Company has agreed to install in the near future, incandescent lights, replacing the present arcs at points to be designated by the City Council.

SEATTLE, WASH.—The committee appointed by the City Council to investigate the feasibility of developing a power site 75 miles from Seattle on the Sauk and Suiattle River courses, in an unofficial statement, report that the site under contemplation as an adjunct to the present municipal plant is desirable and well worth development. A joint report will be submitted later to the Mayor and City Council for action.

BEND, ORE.—The Bend Water, Light & Power Company, under the direction of M. J. Danielson, is making improvements and additions to its plant here. Among other improvements to be made is a new generator to be installed this summer.

OAKRIDGE, ORE.—Articles of incorporation have been filed by the Billy Creek Mining Company, of Oakridge, and general offices will be maintained in this city. The company announces its intentions of engaging in the water, light and power business, as well as mining, and that the light and power field will be developed this year. The company plans to serve current to Oakridge and contiguous territory. The incorporators are N. G. Hyland, E. E. Hyland and C. E. MacFarland, all of this city.

PORTLAND, ORE.—Building Inspector Plummer has cancelled the license of the Smith-McCoy Company, electrical contractors, for alleged violation of the Electrical Code. According to reports, the company obtained permits to perform certain electrical work, which in turn was turned over to contractors, who were not registered, according to the terms of the Electrical Code.

SEASIDE, ORE.—W. H. Galvani, engineer for the Pacific Light & Power Co., has asked the City Council for a 25-year franchise. His company has purchased the Seaside Light & Power Company and desires to install a high-tension line from Astoria to Seaside.

KERNVILLE, CAL.—The Pacific Light & Power Corporation has been authorized by the State Railroad Commission to operate under a franchise in Kern County, which gives it the right for 50 years to maintain an electric power and distribution system in a portion of the county. The company intends to serve the following under the franchise at present: Kernville, Quarry, Tehachapi, Monolith cement plant and the Tropico Mining Company.

LOS ANGELES, CAL.—B. C. McEwan has been awarded the contract for additional lighting posts in the Westgate lighting district.

LOS ANGELES, CAL.—The City Council has passed an ordinance providing for the submission to voters at the special election to be held on June 5 of a proposition for the acquisition and construction of a municipal telephone system and the issuance of bonds in the sum of $8,000,000 to pay for the same.

LOS ANGELES, CAL.—The city of Los Angeles and its board of Public Service Commissioners have applied to the State Railroad Commission for a determination of the conditions and manner of the crossing of the high-voltage power lines of the Pacific Light & Power Corporation with the proposed high-voltage power lines of the city and the lines of the Southern California Edison Company.

NEEDLES, CAL.—W. C. Richling was here recently to look over the ground and route for an electric railroad between Needles and Oatman, Ariz. A preliminary survery will be made on which to estimate the cost of the proposed line.

OCEANSIDE, CAL.—H. H. Jones, manager of the San Diego Electric Company, was here recently in connection with the proposed purchase of the local electric plant.

PLACERVILLE, CAL.—A suit has been started in the Superior Court by the Pacific Gas & Electric Company for the condemnation of land in this county which it desires for the right-of-way of a transmission line being constructed between Nevada and San Joaquin Counties.

SAN PEDRO, CAL.—Property owners have petitioned the City Council for the installation of ornamental lights on Sixth Street between Beacon and Pacific Avenues.

SANTA BARBARA, CAL.—Plans are under way for the construction of a radio station on Santa Cruz Island.

CANADA.

VANCOUVER, B. C.—According to reports, the British Columbia Electric Railway Company and the city of Vancouver have completed arrangements whereby the company will install 400-candlepower nitro-

gen-filled arc lamps with clear globes, to replace the 350-candlepower carbon lamps with frosted globes now in use.

YORKTON, SASK.—Debentures to the amount of $47,500 have been sold by this city, the proceeds to be used for the installation of a second 500-horsepower generating unit in the municipal electric-lighting plant.

Proposals

ELECTRIC BELLS.—Sealed proposals will be received at the office of the business manager of the Board of Education, 730 Tribune Building, Chicago, Ill., May 31, for electric bells for sundry schools, according to plans on file in the office of the repair department.

MOTOR-DRIVEN PUMP.—Sealed proposals will be received June 7 at Room 406, City Hall, Chicago, Ill., for furnishing and delivering in the Rogers Park Pumping Station, 7200 Sheridan Road, on foundations prepared by the city, one motor-driven centrifugal pump and all auxiliaries, appurtenances and accessories, according to plans and specifications on file in the office of the Department of Public Works. W. R. Moorhouse, Commissioner of Public Works.

ELECTRICAL SUPPLIES.—Sealed proposals will be received at the office of the Superintendent of Prisons, Department of Justice, Washington, D. C., until June 19, for furnishing and delivering at the United States penitentiary, Atlanta, Ga., addition to main switchboard, power tablets, etc., and electric feeders for light and power to west main cell wing, in accordance with specifications. Copies of the specifications, together with further information, may be had upon application to the above-named office.

ELECTRIC ELEVATORS.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m., June 22, for the installation complete of an electric passenger elevator in the United States post office and courthouse at Opelika, Fla., and for an electric passenger elevator in the United States post office, courthouse, and custom-house at Corpus Christi, Tex., in accordance with the drawings and specification, copies of which may be had at that office in the discretion of the Supervising Architect, James A. Wetmore, Acting Supervising Architect.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9710, Washington, D. C., one feeder panel and equipment, and 17,000 feet of weather-proof copper wire. Schedule 9715, Newport, R. I., 15,000 feet ebonite tubing. Schedule 9718, Brooklyn, N. Y., 50 parabolic searchlight mirrors. Schedule 9720, Philadelphia, Pa., 5,000 solid, arc-lamp carbons and 10,000 feet flexible cord for portables. Schedule 9732, Norfolk, Va., 12 portable, 0.25-horsepower ventilating sets. Schedule 9732, Brooklyn, N. Y., 20,000 feet of double-conductor wire and 47,000 feet of twin-conductor wire. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

ELECTRIC-LIGHTING SYSTEM.—Sealed proposals will be received June 16 at Trenton, Neb., for furnishing material and labor for the construction of an electric-lighting system, separate bids being received as follows: For the furnishing of all labor and materials for the construction of the complete improvement; for the furnishing of one 35 to 40-horsepower oil engine direct connected to one 25-kilowatt direct-current generator, storage battery, switchboard, and all necessary labor and materials for the installation of the complete plant equipment and for the furnishing of all labor for the complete construction of the pole line and street-lighting system; for the constuction of a brick power station building. A. L. Taylor, Village Clerk. Fairbanks, Morse & Co., Engineers, Omaha, Neb.

New Incorporations

ROUNDUP, MONT.—A. L. Powell Power Company. Capital, $1,000,000. Manufacturing and construction. Incorporators: A. L. Powell, M. C. White and others.

BEAUMONT, CAL.—Riverside County Gas & Power Company. Capital, $100,000. Incorporators: G. W. Lindsay, W. H. Ranhart, F. N. Hawes, K. R. Smoot and L. H. Gates.

ST. LOUIS, MO.—J. C. C. Waldeck Electric Railway Company. Capital, $10,000. Build an electric railway. Incorporators: J. C. C. Waldeck, A. Bischoff, F. Schmidt and others.

LOUISVILLE, KY.—Best Manufacturing Company. Capital, $100,000. Manufacture electrical and other appliances for automobiles. Incorporators: G. H. Turner, A. T. Burgevin and S. S. Fitzpatrick.

BAY SHORE, N. Y.—Universal Lighting Systems Corporation. Capital, $100,000. Manufacture lighting and heating systems. Incorporators: G. W. Lindsay, W. H. Randall and H. P. Porter, New York City.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 21,221. HYDROELECTRIC PLANT.—An American consular officer in the Far East advises that a mining company in his district is planning to install a small hydroelectric plant and wishes to receive quotations from American manufacturers for a complete equipment. Correspondence should be in French and quotations in francs. Measurements should be stated in the metric system.

NO. 21,230. ELECTRIC POWER PLANT.—An American consular officer reports the publication in a trade journal of an invitation for bids for the supply and delivery of overhead mains and street-lighting equipment, power-station equipment, service meters, line transformers, and accessories, in New Zealand. Sealed tenders for the supply of this material will be received by the Town Clerk, Oamaru, New Zealand, until June 23, 1916. Copies of the specification, conditions of contract, and forms of tender, together with blue prints, may be seen at the council's offices, Oamaru, and copies may be obtained on payment of $5.11 for each contract. The Bureau has no further information in regard to this opportunity.

NO. 21,239. ELECTRIC LAMPS.—A dealer in electrical apparatus in Spain informs the Bureau that he desires to communicate with American manufacturers of so-called "one-half watt or nitrogen" electric lamps.

NO. 21,256. ELECTRICAL SUPPLIES AND MACHINERY.—A firm of exporters and importers in the Orient desires to be placed in communication with manufacturers and exporters of electrical supplies and machinery for the manufacture of silk and cotton tape. Catalogs and price lists, etc., should be sent. References are furnished.

NO. 21,330. CARBONS, ETC.—An American consular officer in the United Kingdom reports that a man in his district desires to receive quotations on carbons used for cinematographs measuring 12 inches in length by 16 and 22 millimeters. He is also in the market for metal filament bulbs for flash-lamp batteries.

Financial Notes

The Grand Rapids (Mich.) Railway Company has been granted permission to issue $3,500,000 in bonds in order to retire outstanding bonds and take care of current liabilities.

The Long Island Lighting Company, of Northport, N. Y., has applied to the Public Service Commission for authority to issue $92,000 par value of additional five-per-cent, 25-year, first-mortgage bonds, under a trust mortgage heretofore approved by the commission, and $80,000 par value of the capital stock of the company.

An income balance of $129,418 for a nine-month period ending March 31 is shown in a financial statement recently submitted by the San Francisco-Oakland Terminal Railways with its request to buy new cars. The statement shows that its total operating income for this period was $837,278; its gross income, $885,157, and its total deductions from gross income, $755,739.

The Greenfield (Mass.) Electric Light & Power Company plans to put in effect an issue of employee's stock to the amount of $50,000, in $10 shares, to be subscribed for by people in the company's employ, and will probably petition the Gas and Electric Light Commission for approval of such an issue, in the near future.

Lincoln Gas & Electric Light Company has called for payment at 101 and interest on July 1 the $500,000 three-year six-per-cent collateral notes due July 1, 1917.

Middle West Utilities Company announces that it will pay on June 1 through the Illinois Trust & Savings Bank the $3,500,000 six-per-cent collateral-trust notes dated June 1, 1913.

The California Railroad Commission has authorized the Mount Whitney Power & Electric Company to issue at not less than 96 $450,000 first-mortgage six-per-cent bonds, the proceeds to be applied to various capital expenditures on the properties.

New Orleans Railway & Light Company has sold to Bertron, Griscom & Company, Reilly, Brock & Company and the Hibernia Bank & Trust Company, of New Orleans, $3,250,000 refunding and improvement five-per-cent bonds, due 1949, and $3,250,000 two-year six-per-cent notes. Proceeds of these securities will pay off the $4,000,000 six-per-cent notes maturing June 1, give the company ample funds for improvements made and to be made, and also will purchase and cancel $1,000,000 of the French series of refunding and improvement five-per-cent bonds. A selling syndicate has been formed and is offering the notes at par and interest and will soon make an offering of the five-per-cent bonds.

Papers are being drawn up for a three-year extension of the Chicago Elevated Railroad Company $14,000,000 two-year five-per-cent notes. The interest rate will be raised to six per cent, according to an understanding recently reached in New York between the Samuel Insull Syndicate and the National City Bank, which holds a majority of the notes and will carry those presented for payment upon maturity on July 1. In case any holders of notes of the Chicago Elevated do not agree to the extension, but present their holdings for payment on July 1, Samuel Insull has made an arrangement with the National City Bank whereby the payments will be made.

Dividends.

	Term	Rate	Payable
Conn. Power, pf.	Q	$1.50	June 1
Dom. Pw. & Trans., com.	—	2 %	June 15
East. Shore Gas & Elec., pf.	Q	1.5 %	June 1
Interstate Elec. Corp., pf.	Q	1.75%	June 1
National Carbon, com.	Q	2 %	July 15
Penn. Water & Pw.	Q	1 %	July 1
Pensacola Elec., pf.	S	$3	June 1
Stand. Gas & Elec., pf.	Q	1 %	June 15
Third Ave. Ry.	Q	1 %	July 1
United Rys. & Elec., pf.	S	2 %	June 1

Reports of Earnings.

PHILADELPHIA COMPANY.

The Philadelphia Company has issued its pamphlet report for the year ended March 31, 1916. Income account of the Philadel-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 29	May 22
American Tel. & Tel. (New York)	129¾	128⅞
Commonwealth Edison (Chicago)	141⅜	141
Edison Electric Illuminating (Boston)	238	235
Electric Storage Battery common (Philadelphia)	63	64½
Electric Storage Battery preferred (Philadelphia)	63	64½
General Electric (New York)	170½	172¼
Kings County Electric (New York)	130	129
Massachusetts Electric common (Boston)	—	37
Massachusetts Electric preferred (Boston)	—	7
National Carbon common (Chicago)	170	170
National Carbon preferred (Chicago)	122	—
New England Telephone (Boston)	132	132½
Philadelphia Electric (Philadelphia)	27⅝	27¾
Postal Telegraph & Cables common (New York)	83½	85
Postal Telegraph & Cables preferred (New York)	68	68
Western Union (New York)	96	94
Westinghouse common (New York)	62	62
Westinghouse preferred (New York)	70	70

phia Company proper compares as follows:

	1916	1915
Total earnings	$8,028,519	$7,288,753
Expenses and taxes	3,405,047	3,406,884
Net earnings	4,623,473	3,881,869
Other income	2,658,048	2,312,527
Total income	7,281,520	6,194,395
Charges, rents, etc	2,393,235	2,251,092
Balance	4,888,285	3,943,304
Improvements, betterments, etc.	1,030,902	1,106,736
Surplus	3,857,383	2,836,568

PITTSBURGH RAILWAYS.

Pittsburgh Railways Company has issued its pamphlet report for the year ended March 31, 1916. Income account compares as follows:

	1916.	1915.
Gross earnings	$12,123,276	$11,670,091
Total operating expenses	7,243,388	7,615,120
Taxes	447,516	438,082
Net operating revenue	4,432,372	3,616,889
Auxiliary earnings	48,017	46,435
Total net earnings	4,480,389	3,663,324
Other income	107,435	112,832
Total income	4,587,824	3,776,156
Rent and current interest	2,974,531	2,955,797
Interest on funded debt	389,106	389,621
Net income	1,224,187	430,739
Interest on debentures	600,000	360,739
Improvements, depreciation, etc	512,579	.....
Surplus for year	111,608	100,000
Previous surplus	627,274	636,982
Deductions from surplus	89,672	109,708
Profit and loss surplus	649,210	627,274

MONTREAL LIGHT, HEAT & POWER.

Montreal Light, Heat & Power Company reports income account for fiscal year ended April 30, 1916:

	1916	1915
Gross earnings	$6,977,168	$6,717,106
Expenses and maintenance	2,856,798	2,881,198
Depreciation and renewals	675,000	650,000
Net earnings	3,345,370	3,085,908
Interest charges	487,181	485,198
Dividends	1,870,940	1,827,500
Surplus	987,248	769,243

COLUMBIA GAS & ELECTRIC.

	1916	1915
April gross	$ 787,924	$ 720,932
Net	427,505	382,456
Total income	467,326	423,171
Surplus after charges.	126,134	86,152
Four months' gross	3,477,541	3,241,859
Net	1,886,497	1,737,775
Total income	2,039,931	1,893,346
Surplus after charges.	690,252	543,485

For April, 1916, gross of South Covington & Cincinnati Street Railway increased 5.7 per cent, electric revenues of Union Gas & Electric Company, 17.3 per cent, and gas revenues, 3.6 per cent; electric revenues of Union Light, Heat & Power Company increased 12.3 per cent and gas revenues 28.5 per cent over corresponding month of preceding year.

GREAT WESTERN POWER.

Great Western Power Company has issued its report for April and the 12 months ended April 30. The figures for April are:

	1916	1915
Operating revenue	$293,519	$237,392
Operating expense and taxes	101,479	64,381
Net	192,040	173,011
Other income	272,688	201,682
Total income	228,984	193,851
Interest in funded debt	139,942	106,521
Surplus	89,041	87,330
Accrued dividends	12,500	.....
Balance of surplus	76,541	74,830

For the 12 months ended April 30 the figures are:

	1916	1915
Operating revenue	$3,326,362	$2,727,850
Operating expense and taxes	1,114,212	826,519
Net	2,212,449	1,901,331
Other income	272,688	201,682
Total income	2,484,837	2,103,013
Interest on funded debt	1,420,743	1,229,455
Surplus	1,064,094	873,558
Accrued dividends	150,000	.....
Balance of surplus	914,094	873,558

DUQUESNE LIGHT.

Duquesne Light Company has published its pamphlet report for the year ended March 31, 1916. Income account compares as follows:

	1916	1915
Total earnings	$5,368,025	$4,938,862
Expenses and taxes	2,672,874	2,737,580
Net earnings	2,695,151	2,201,282
Other income	224,386	258,658
Charges, rents, etc	727,803	690,836
Balance	2,191,734	1,769,104
Discounts, depreciation, etc.	577,247	204,954
Surplus	1,614,487	1,564,150
Previous surplus	571,117	243,743
Total surplus	2,185,603	1,807,893
Preferred dividend	205,702	46
Common dividend	1,264,706	1,236,730
Improvements and betterments written off	95,774	.....
Total deductions	1,566,182	1,236,776
Profit and loss surplus	619,421	571,117

PACIFIC GAS & ELECTRIC.

Pacific Gas & Electric reports for April, first four months of 1916 and twelve months ended April 30 as follows:

	1916	1915
April gross	$1,486,528	$1,512,103
Net after taxes	598,413	652,125
Total income	627,482	680,975
Surplus after charges	292,314	324,641
Four months' gross	6,364,436	6,261,430
Net after taxes	2,684,635	2,765,731
Total income	2,864,164	2,865,895
Surplus after charges	1,507,497	1,405,331
Balance after preferred dividends	1,055,468	1,040,868
Balance after common dividends	630,755	558,350
Twelve months' gross	18,633,307	17,448,235
Net after taxes	7,863,612	7,335,439
Total income	8,356,856	7,629,640
Surplus after charges	4,314,932	3,077,652

BYLLESBY PROPERTIES.

Combined earnings of public utility properties operated by H. M. Byllesby & Company, including Northern States Power and Standard Gas & Electric, were as follows for April and twelve months ended April 30:

	1916	1915
April gross	$1,388,331	$1,272,839
Net after taxes	683,227	602,256
Twelve months' gross	16,039,031	14,862,419
Net after taxes	7,913,921	7,116,491

CALIFORNIA-OREGON POWER.

California-Oregon Power Company reports for 1915 as follows:

Operating revenue	$392,350
Operating expense	332,406
Net	59,944
Non-operating revenue	5,998
Gross corporate income	65,943
Interest on funded debt	213,063
Other interest deductions	680
Miscellaneous deductions	3,897
Total deductions	217,641
Net corporate loss for year	151,698
Miscellaneous additions	2,295
Miscellaneous deductions	16,757
Surplus December 31, 1914	25,720
Deficit December 31, 1915	140,439

GEORGIA RAILWAY & POWER.

	1916	1915
April gross	$ 586,137	$ 527,389
Expenses and taxes	317,085	306,839
Net earnings	269,052	220,550
Four months' gross	2,322,014	2,132,689
Expenses and taxes	1,302,318	1,268,889
Net earnings	1,019,696	863,800

New Publications

RICHMOND REPORT.—The annual report of the Electrical Department of Richmond, Va., for 1915 has been printed. It covers electrical inspection and street lighting, which is done by a municipal plant. E. W. Trafford is city electrician.

MINERAL RESOURCES.—The United States Geological Survey has issued two large volumes dealing with "Mineral Resources of the United States for 1914." Part I treats of metals, while Part II deals with nonmetals. Figures for production are given and are followed by a series of articles on individual topics. The two volumes comprise 2,190 pages.

Electrical Patents Issued May 16, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,183,870. Portable Electric Lamp. H. M. Greist, F. W. Beckert and G. L. Hinman, assignors to The Greist Mfg. Co., New Haven, Conn. Structure of standard having sheet-metal base.

1,183,871. X-Ray Tube. E. Grimes, Des Moines, Iowa. Delivers beam of parallel rays.

1,183,875. Electrical Circuit. R. V. L. Hartley, assignor to Western Electric Co., New York, N. Y. Network containing thermionic amplifier.

1,183,877. Electromagnetic Regulating Device. G. Honold, assignor to the firm of R. Bosch, Stuttgart, Germany. Comprises compression resistance with provision for maintaining even distribution of resistance mass.

1,183,881. Apparatus for Interconverting High-Potential Polyphase and Direct Electric Currents. C. G. Koppitz, Youngstown, O. Alternating winding tapped to segments of commutator, commutator and brushes relatively rotated in synchronism with current.

1,183,882. Means for Transferring High-Potential Electric Currents in Parallel Equal Arcs. C. G. Koppitz, Wilkinsburg, Penn. For converting alternating to direct current.

1,183,883. Means for Transferring High-Potential Electric Currents as Interrupted Arcs. C. G. Koppitz,. Wilkinsburg, Penn. Modification of above.

1,183,890. Electrical Controlling System. A. E. Lundell, assignor to Western Electric Co. Telephone trunking system.

1,183,912. Electromagnetic Brake. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Electrically controlled valves effects pressure reduction in auxiliary reservoir to supply fluid to brake cylinder.

1,183,913. Electric Fluid-Pressure Brake. W. V. Turner, assignor to Westinghouse Air Brake Co. Electrically controlled valve vents fluid from piston chamber to apply brakes.

1,183,923. Selecting Apparatus. F. A. Watkins, assignor to Western Electric Co., New York, N. Y. Semi-automatic telephone system.

1,183,924. Electrically Heated Vessel. W. L. Waters, Milwaukee, Wis. Immersion heater suspended from tea-kettle lid.

1,183,925. Electric Heater System. W. L. Waters, Milwaukee, Wis. Body has heating coils of high and low electrical input, which are automatically substituted for each other according to temperature of body.

1,183,926. Heating Apparatus. W. L. Waters, Milwaukee, Wis. Heater between compartments delivers more heat to one than other.

1,183,946. Leak-Nullifying Means for Telegraph Systems. J. H. Bell, assignor to Western Electric Co. Condenser arranged to be charged and discharged by operation of key, thereby momentarily de-energizing relay and opening line circuit.

1,183,949. Electric Therapeutic Device. F. F. Burdick, Milton, Wis. Adjustable support for electric heater.

1,183,951. Jar for Electric Batteries. R. N. Chamberlain, assignor to Gould Storage Battery Co., New York, N. Y. Details of ceramic structure.

1,183,992. Method of Cast-Welding Electric Bonds. J. C. Lincoln, Cleveland, O. For applying bonds to rail ends by use of arc.

1,183,993. Method of Bonding Railway Rails. J. C. Lincoln. For applying bond of relatively higher thermal and electric conductivity to rail ends by use of arc.

1,183,995. Car-Control System. P. J. McGowan and R. J. Dikeman, New York, N. Y. Controller on rear car rendered operative or inoperative by motorman on forward car.

1,184,001. Loading Coil for Telephone Lines. W. Merz, assignor to Western Electric Company. For phantom line systems.

1,184,017. Relay. P. M. Rainey, assignor to Western Electric Co. Details of polarized device.

1,184,020. Switch-Stopping Mechanism. J. N. Reynolds, assignor to Western Electric Co. For telephone switch.

1,184,029. Automatic Safety Device for Automobiles. E. Schatz and B. Whitehouse, Vincennes, Ind., assignors of one-third to E. Morgan, Vincennes, Ind. Gage connected with crank casing has contact controlling float.

1,184,041. System for regulating the amperage and voltage of Arc-Lamp Circuits. A. D. Standeford, Kansas City, Mo. Resistance switching device.

1,184,054. Trolley-Wheel Adjuster. G. Ulrich, Los Angeles, Cal. Telescoping sleeve at end of pole secured thereto by spring opposing both reciprocating and turning movements.

1,184,056. Self-Contained Generating and Lighting Unit. H. R. Van Deventer, Sumter, S. C. Armature of magneto carries lamp.

1,184,063. Pull-Switch Socket for Electric Lamps. R. B. Benjamin, Chicago, Ill. Combined socket and shade with pull cord between lamp and shade.

1,184,086. Chemical Process. C. Ellis, Montclair, N. J. Process of hydrogenating oils, etc., comprising use of nascent and electrolytic hydrogen.

1,184,089. Apparatus for Transferring Knitted Fabric. H. T. Fleischer, Philadelphia, Pa. Mounting of lamp, etc., for lighting transferring.

1,184,090. Direction-Predicter for Vehicles. H. J. Frerks, Chicago, Ill. Indicating lamps under control of driver and passenger.

1,184,091. Electric-Storage Cooker. R. E. Frickey, Redding, Cal. Arrangement of heat-insulation and storage devices.

1,184,104. Electric Switch. C. J. Klein, assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Two-push-button mechanism for socket.

1,184,105. Electric Attachment Device. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Attachment plug and receptacle with contacts having snap action independent of rate of movement of plug.

1,184,134. Combined Car Signal and Control Apparatus. H. Rountree, assignor to National Pneumatic Co., New York, N. Y. For elevators; when car door opens and switch closed motor is inoperative and signal operative.

1,184,135. Dry Cell. J. Rudolphs, Henriksdal, Sweden. Porous electrode treated with hygroscopic material absorbs moisture from air to prevent drying out of pasty electrolyte.

1,184,157. Dynamoelectric Machine. E. J. Andrews, assignor of one-fourth to G. L. Chindahl, Chicago, Ill. Armature comprises circuit-changer for changing connections of coils to wave or lap winding.

1,184,161. Connector for Electrical Conduits. H. D. Betts, assignor to Thomas & Betts Co., New York, N. Y. For spirally wound conduit.

1,184,162. Selector Switch. G. A. Betulander, assignor to Betulander Automatic Telephone Co., London, England. Structure of device for telephone system.

1,184,163. Automatic Telephone System. G. A. Betulander, O. Grahn and N. G. Palmgren, assignors to Relay Automatic Telephone Co., London, England. Arrangement of circuits, selectors, impulse transmitters, etc.

1,184,169. Elevator System. E. L. Dunn, assignor to Standard Plunger Elevator Co., Worcester, Mass. Arrangement of signals in automatic system.

1,184,178. Electrical Vaporizing Apparatus. M. W. Hanks, Indianapolis, Ind. Structure of device having spaced electrodes which can be set for vaporizing certain amount.

1,184,183. Switch. A. A. Kent, Philadelphia, Pa. For ignition circuit.

1,184,200. Apparatus for Heating Water. J. E. E. Nash, Palmyra, Nebr. Immersion device.

1,184,224. Dynamoelectric Gear of the Unipolar Type. M. Breslauer, Berlin, Germany. Combination of two machines with stators forming a common housing.

1,184,230. Vibrating Rectifier. D. C. Davis, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Has auxiliary flux for opeating during starting period in Wheatstone-bridge arrangement for charging batteries.

1,184,233. Rectifying Apparatus for Electric Currents. F. Giglio, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Electromagnetic vibrator arrangement.

1,184,234. Electrically Lighted Switch. W. M. Goehrend, assignor of 40/100 to V. K. Wyndearo and 20/100 to A. F. Goehrend, Aberdeen, Wash. Lamp in push button lighted when latter depressed.

1,184,236. Electric Heater for Soldering Irons. J. T. Hawkins, Tacoma, Wash. Structure of heating chamber for receiving irons.

1,184,244. Electric Piano-Player with Damping Device. J. F. Kelly, Pittsfield, Mass. Inductive means controls magnetism of key-operating magnets.

1,184,262. Controlling Mechanism for Alternating Machines. A. Redfield, Ogden, Utah. Magnetic circuit of compensator is varied.

1,184,264. Controller for Groups of Electric Circuits for Advertising and Other Purposes. E. Savoye, St. Etienne, France. Contacts controlled by ball rolling between compartments in shiftable container.

1,184,266. Voltage Regulator. E. O. Schweitzer, Chicago, Ill. For lamp and motor load branches connected in parallel to service transformer.

1,184,278. Electric-Conduit Junction-Box. F. H. Terry and H. M. Bigwood, Wolverhampton, England. Manner of connecting pipe to box.

1,184,313. Electrical Plug. D. E. Bown, Crafton, Pa. Details of device having single integral main member.

1,184,336. Combination Wire Support for Electric Distribution. J. L. Fay, assignor to W. N. Mathews and Brother, St. Louis, Mo. Pole bracket.

1,184,376. Radio Telegraphy and Telephony Receiver. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., Boston, Mass. Manner of associating detector with receiving coil and earth.

1,184,396. Electrically Illuminated Shoe. J. E. Trimble, Chicago, Ill. Ornamental device with battery lamp for toe of shoe.

1,184,400. Lamp. E. W. Wilson, Chicago, Ill. Details of headlight reflectors.

1,184,402. Spark-Plug Tester. W. S. Witter, Toledo, Iowa. Cap for applying current.

1,184,430. Temperature-Control Mechanism. A. De Khotinsky, assignor to Central Scientific Co., Chicago, Ill. In water heater, units cut in and out by thermally controlled electromagnets.

1,184,434. Method of and Apparatus for Wireless Telephony and Telegraphy. C. D. Ehret, Philadelphia, Pa. Separately generating high-frequency oscillations, of high and low power, modifying latter by speech and transmitting resultant.

1,184,453. Mining-Machine Truck. E. L. Hopkins, assignor to Jeffrey Mfg. Co., Columbus, O. Comprising reeling mechanism for electric cable.

1,184,454. Electrical Switch. B. D. Horton, Detroit, Mich. Iron-clad.

1,184,456. Electrochemical Treatment of Metal-Bearing Material. W. H. James, assignor to New Refractory Ores, Limited, Johannesburg, Transvaal, South Africa. Refractory precious metal ore made amenable to cyanide process by treatment with anode solution on electrolyzing eodium chlorid.

1,184,458. Vacuum Cleaning Machine. J. B. Kirby, Cleveland, O. Mounting of motor.

1,184,460. Process of and Apparatus for Regulating Synchronous Motors Controlling the Speed of Converter Collector Brushes. C. G. Koppitz, Youngstown, O. Fixed frequency maintained.

1,184,461. Safety Appliance for Elevators. J. J. Kuntz, Brooklyn, N. Y. Details of cam switch.

1,184,503. X-Ray Apparatus. M. Alden, Springfield, Mass. For holding tubes.

1,184,520. Electric Furnace Permitting the Extraction in a State of Purity of Zinc from its Ores. E. F. Cote and P. R. Pierron, assignors to Societe Anonyme pour Electrimetallurgie du Zinc, Procedes Cote et Pierron, Lyon, France. Ores melted in arc and resistance furnace and indirect resistance furnace in which zinc vapors separated and condensed.

1,184,536. Portable Electrical Measuring Instrument. M. B. Kassel and A. Finkenberg, New York, N. Y. Battery tester has coil which is zigzag strip stamped from sheet-metal body.

1,184,539. Electric Table Attachment. D. H. Kendelhardt, Brooklyn, N. Y. Push buttons on reeled cords.

1,184,570. Trolley Ear. W. A. Rice, Huntsville, Mo. For engaging round wire.

1,184,573. Trolley-Wire Support. G. H. Goff and L. Rollins, Roda, Va., assignors of one-half to W. A. Owens, Roda, Va. Clamp for "S" wire.

1,184,597. Apparatus for Regulating Street Traffic. J. G. Wallmann, Oakland, Cal., assignor of one-third to C. A. McCann, Berkeley, Cal., and one-third to J. G. Sherry, Oakland, Cal. Manually operated and has horn and semaphore carrying lamps.

1,184,598. Apparatus for Regulating Street Traffic. J. G. Wallmann, Oakland, Cal. Semaphore and fluid-pressure whistle operated by electromagnets.

1,184,602. Train-Controlling System. T. Williams, Eddystone, Pa. Special switch structure.

1,184,607. Cinematographic Apparatus. W. H. Anderson, London, England. Solenoid closes safety shutter if sprocket fails to grip film.

1,184,613. Light Reflector for Engine Cabs. J. L. Boyd and L. Sawallirch, Glendive, Mont. Has electric socket and will also receive gas or oil lamp.

1,184,636. Trolley-Pole. A. E. Feagan and J. C. Nelson, Marine City, Mich. Links connecting pole with stand.

1,184,657. Timing Device for Electric Circuits. S. J. Paul, Los Angeles, Cal. Details of interrupter mechanism.

1,184,658. Time System. A. A. Radtke, assignor to Electric Time Recorder Co., Chicago, Ill. Successively energized magnets, controlled by rotary switch and time mechanism, rotate shaft.

1,184,664. Vibrator. W. R. Sorgel, assignor to International Electric Tool Co., Milwaukee, Wis. Arrangement of segmental switching device for rapidly energizing and de-energizing magnet.

1,184,675. Vibrator. W. H. Gaulke, assignor to International Electric Tool Co. Related to above; operated from alternating current.

1,184,676. Lamp Shade. E. G. George, Springfield, Ill. For incandescent lamp; body frame and cap from single sheet.

1,184,678. Switching Device. D. D. Gordon, assignor to Yost Electric Mfg. Co., Toledo, O. Pull-socket movement.

1,184,685. Electric Fire-Alarm System. J. L. Flagg and F. T. Towers, assignors to Watson-Electric Co., Paterson, N. J. Comprises combination of storage battery and preferred energy source.

1,184,692. Automatic Means for Operating Valves of Gas Generators. J. C. Shaw, assignor to The Bartlett Hayward Co., Baltimore, Md. Governed by time-controlled electrical mechanism.

1,184,704. Electrical Synchronizing for Talking Motion Pictures. G. P. McDonnell, St. Louis, Mo., assignor of one-half to J. M. Hockmuth, St. Louis, Mo. Interrelated signals for motor-driven phonograph and hand-operated picture machine.

1,184,706. Resistance Grid. W. H. Keller, Norton, Va. Non-cast iron, for rheostats and heaters.

PATENTS EXPIRED.

The following United States electrical patents expired on May 30, 1916:

725,763. Ground Detector. E. M. Hewlett, Schenectady, N. Y.

625,786 to 625,788. Electric-Lighting Device. S. E. Mosher, Chillicothe, O.

625,792. Electromagnetic Mechanism for Actuating Engine Valves. E. W. Naylor, Philadelphia, Pa.

625,797. Telephone Switchboard. J. M. Overshiner, Elwood, Ind.

625,806. Operating Dynamoelectric Machines. E. W. Rice, Jr., Schnectady, N. Y.

625,816. System of Electrical Distribution. E. Thompson, Swampscott, Mass.

625,823. Telegraphy by Means of Electric Light. K. Zickler, Brunn, Austria-Hungary.

625,828. Cable Coupling. F. E. Case, Schenectady, N. Y.

625,830. Inspector's Indicating Wattmeter. F. P. Cox, Lynn, Mass.

625,875. Electrically Controlled and Operated Railway Signal. W. Daves, Jersey City, N. J.

625,915. Controller. T. von Zweigbergk, Cleveland, O.

625,921. Rotary Circuit-Breaker. H. Boas, Berlin, Germany.

625,923. Magneto-Bell Striker. R. Brueckner, Boston, Mass.

625,938. Accumulator Plate. H. B. Osborn, Chicago, Ill.

625,953. Electric Device for Propelling and Controlling Vehicles. R. M. Hunter, Philadelphia, Pa.

626,009. Transmitting Movement to a Distance by Electromagnetic Mechanism. E. Raverot and P. Belly, Paris, France.

626,017. Incandescent Electric Lamp. R. W. Carroll, Blandinsville, Ill.

626,020. Mechanism for Starting, Stopping and Reversing Direction of Motion of Electric Motors and for Controlling Speed of Same. F. H. Foster, New York, N. Y.

626,033. Electrolytic Apparatus and Process of Treating Impregnators Therefor. M. Perreur-Lloyd, Paris, France.

626,065. Insulator. W. E. Holmes, Newton, Mass.

626,111. Telephone-Connecting Circuit. G. K. Thomson, M. and T. C. Wales, Jr., Newton, Mass.

626,131. Selective Electric Signal. J. A. Barrett, Summit, N. J.

626,132. Selective Privacy-Switch for Multiple-Station Telephone Lines. J. A. Barrett, Summit, N. J.

626,134. Prepayment Electrical Meter. C. O. Bastian, London, England.

626,135. Electrolytic Meter. C. O. Bastian, London, England.

626,143. Insulated Joint for Electric Fixtures. E. E. Clift, Philadelphia, Pa.

626,146. Telephone Toll Circuit. H. M. Crane, Boston, and T. C. Wales, Jr., Newton, Mass.

626,168. Trolley Catcher. F. N. Kelsey, New Haven, Conn.

626,172. Rotary Transformer or Synchronous Motor. B. G. Lamme, Pittsbugh, Pa.

626,190. Electric Arc Lamp. J. R. Pepin, Chicago, Ill.